AN AZOREAN COLLECTING GROUND.

(PICO DO CARVÃO).

MISSOURI

BOTANICAL GARDEN.

EIGHTH ANNUAL REPORT.

ST. LOUIS, MO.:
PUBLISHED BY THE BOARD OF TRUSTEES.
1897.

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A. D. CUNNINGHAM, Secretary.

***Ex-officio.*

[1] Elected President of the School Board May 31, 1897, to succeed Henry Bus, who had held that office since March 12, 1896.

[2] Elected Mayor of the City of St. Louis, April 6, 1897, to succeed Cyrus P. Walbridge, who was elected to that office April 4, 1893.

PREFACE.

Under direction of the Board of Trustees, the eighth annual report of the Missouri Botanical Garden is presented to the public. The seventh report was issued May 23, 1896. Advance copies of M. Cardot's papers on Mosses of the Azores and of Madeira were issued April 14, 1897.

The reports of the Garden are sent regularly to scientific institutions and journals, in exchange for publications or specimens desirable for the library, herbarium, or plant-houses of the Garden. So far as possible, reprints of the botanical articles which they contain are sent to botanists occupied with a study of the same subjects.

Any of the Garden publications not out of print may be purchased, at approximately the cost of publication, from Dr. A. E. Foote, of Philadelphia, the Cambridge Botanical Supply Co., of Cambridge, Mass., W. Wesley & Son, of London, R. Friedländer & Sohn, of Berlin, or the undersigned. A list of the papers thus far published is to be found at page 221 of the present volume.

WILLIAM TRELEASE.

St. Louis, July 31, 1897.

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IN THE AGAVE HOUSE.

REPORTS FOR THE YEAR 1896.

REPORT OF THE OFFICERS OF THE BOARD.

SUBMITTED TO THE TRUSTEES JANUARY 13TH, 1897.

To the Board of Trustees of The Missouri Botanical Garden:

The financial statement herewith presented shows satisfactory results. Owing to the depressed condition of business, necessitating a reduction of rentals in some cases and vacancies in two large buildings for a portion of the year, the receipts from rentals have not equaled those of the preceding year by $3,186.71, but both of these buildings have been leased for a term of years at good prices and no further vacancies or reductions of rentals are anticipated at present. The properties of the Board have been kept in good repair and with few exceptions are all rented. The tornado of May 27th caused great damage to many buildings belonging to the Board, as much of its property was located directly in the path of the storm, and 58 buildings were damaged in amounts ranging from $5.00 to $2,000.00 each, and $7,946.06 was expended in restoring these buildings to their original condition. The Garden suffered severely by the destruction of trees, shrubs and damage to buildings and plant houses, necessitating an expenditure of $4,479.36 for labor and material.

The efforts made in 1895 to lease for residence purposes certain properties of the Board lying west of Grand Avenue having failed, the Board authorized its attorneys to bring suit in the Circuit Court, City of St. Louis, asking for au-

thority to sell all or a portion of its property lying west of Grand Avenue, except the Garden and the farm adjoining.

This cause was called for hearing before Judge Valliant on June 8th, and after two days' trial was submitted to the Court. On August 17th a decree and judgment were entered for the plaintiffs. The cause is now pending in the Supreme Court of the State. An application for an advancement of the case in that Court was made, but was not granted, but the application will be renewed at the April term and it is hoped a decision will be rendered during the year.

In view of the proposed opening, widening and improvement of Flora Avenue and other streets near the Garden, applications have already been received for the purchase of building sites.

Further additions have been made to the library, herbarium and furniture, and the following sums have been credited to the stock account as a permanent investment, which now aggregates $1,528,081.42:—

Library (purchases and donations)	$4,049 12
Herbarium (purchases and donations)	1,646 70
	$5,695 82

Mr. Shaw's bequests for banquets, sermon, premiums for flower show, and Shaw School of Botany, have all been faithfully carried out; and after supporting the Garden, caring for the properties of the Board and the restoration of the buildings damaged by the tornado, and repairing damages at the Garden, all of which having been paid for out of the revenues for the year, we carry forward only a small balance.

For a full and detailed account of the receipts and expenditures you are referred to the following statement:—

RECEIPTS.

Rents	$94,681 19	
Interest, dividends and cash discounts on taxes.	3,922 64	
Garden, pasturage, sales, etc	491 00	
Garden hand book sales	65 75	
Publications sales	5 80	$99,166 38
Stock Account paid by Administrator, balance	5,051 82	
Streets, damages for opening	8,258 30	13,310 12
		$112,476 50
Cash balance, January 1st, 1896		11,485 51
Total		$123,962 01

EXPENDITURES.

Garden Account,		
Labor pay roll	$11,803 70	
Students' pay roll	1,539 60	$13,343 30
Office assistance	520 33	520 33
Fuel	818 48	818 48
Water	706 00	
Repairs and supplies	1,480 16	2,186 16
Stable and implements	859 11	859 11
Plants and seeds	1,194 73	1,194 73
Herbarium,		
Office assistance	298 00	
Janitor's services	90 00	
Extra mounting	51 41	
Fuel	75 03	
Current expenditure	1,762 43	2,276 87
Library,		
Office assistance	368 22	
Salary of Indexer	480 00	
Fuel	75 02	
Current expenditure and books	3,537 93	4,461 17
Office,		
Salaries	4,371 67	
Telephone	100 00	
Fuel	75 01	
Current expenditure	251 80	4,798 48
Research,		
Salary of artist	425 00	
Other salaries	565 62	
Incidentals	20 75	1,011 37
Carried forward	$31,470 00	$31,470 00

Brought forward	$31,470 00	$31,470 00
Scholarship,		
Instruction	295 00	
Announcement	14 00	
Care of lodge	240 00	
Fuel	46 28	
Other supplies	208 87	804 15
		$32,274 15
Garden Improvement,		
Storm damage	4,479 36	
Extension of garden, etc	506 75	4,986 11
Total for Garden		$37,260 26
Publication Account,		
Annual volume	1,913 24	
Reprint, Vols. 2 and 3	935 22	2,848 46
Property Expense Account,		
Taxes: State, city, school and sprinkling	25,804 28	
Streets, pavements and sewers	4,317 86	
Insurance	5,578 80	
Repairs	5,637 16	
Tornado damage repairs	7,946 06	49,284 16
Office Account,		
Salaries	3,600 00	
Rent of office	840 00	
Printing, postage, and telephone	559 25	4,999 25
Sundry Accounts,		
Legal Expenses	2,232 05	
Streets, benefits for opening	8,100 00	10,332 05
Bequests,		
Premiums to flower show	461 00	
Flower sermon	200 00	
Trustees' banquet	672 55	
Gardeners' banquet	340 80	
Washington University, School of Botany	1,019 80	2,694 15
	$107,418 33	$107,418 33
Invested in 1896		16,537 33
Cash on hand December 31, 1896		6 35
Total		$123,962 01

The books of the Board have been closed after showing the operations for the year ending Dec. 31, 1896, and the receipts have been disposed of as follows:—

Rent account	$94,681 19	
Interest	3,922 64	
Garden hand-book	65 75	$98,669 58

CONTRA.

Garden expense	$31,783 15	
Garden improvements	506 75	
Garden storm repairs	4,479 36	
Office expense	4,999 25	
Repairs	5,637 16	
Insurance	5,578 80	
Taxes	25,804 28	
Street, pavements and sewers	4,159 56	
Damage by storm to revenue property	7,946 06	
Legal expenses	2,232 05	
Washington University, School of Botany	1,019 80	
Flower sermon	200 00	
Trustees' banquet	672 55	
Gardeners' banquet	340 80	
Flower show	461 00	
Publications	2,842 66	
Surplus for 1896	6 35	
	$98,669 58	$98,669 58

Surplus to December 31, 1895		$73,818 49
" for 1896		6 35
		$73,824 84

Respectfully submitted,

R. J. LACKLAND, President.

Attest:
A. D. CUNNINGHAM, Secretary.

EIGHTH ANNUAL REPORT OF THE DIRECTOR.

SUBMITTED TO THE TRUSTEES JAN. 18TH, 1897.

To the Board of Trustees of the Missouri Botanical Garden:

The following report on the Missouri Botanical Garden and the Henry Shaw School of Botany is respectfully submitted, in compliance with the rules of the Board. At the request of the Garden Committee, in addition to a statement of operations for the past year, the present report includes a general summary of what has been accomplished since the organization of the Board in September, 1889.

THE BOTANICAL GARDEN.

One of the first steps taken by the Board of Trustees was the adoption of a general outline policy for the guidance of the Director,* and, as this policy has not been materially changed, the instructions are here quoted, as a convenient means of noting such advances as have been made during the past seven years.

1. To continue or even augment the present ornamental features of the Garden.

2. To add to its botanical usefulness and interest by the introduction, as opportunity offers, of plants representative of the American flora, so that, other things being equal, these shall ultimately be largely represented and may even preponderate outside of the greenhouses, giving then, in the Garden, an epitome of the leading characteristics of our native flora.

3. To carry into execution, as rapidly as possible, a system of correctly naming and labeling all plants in the Garden, with the exception of such as may be used in ribbon gardening or for other exclusively ornamental purposes.

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* First Report. 93.

THE MUSEUM GATE HOUSE.

4. To provide fire-proof quarters for the invaluable herbarium of the late Dr. George Engelmann, and to immediately mount it in the proper manner, so as to insure its preservation and availability for scientific use. Also, to provide for and add to the general herbarium (based on that of Bernhardi) now at the Garden, with the special object of ultimately making it complete in good representatives of American plants.

5. To arrange, bind, and index the books and pamphlets at the Garden. Also, to provide more ample but equally safe accommodations for the library, to bring it up to date as rapidly as possible, to enter subscriptions for periodical publications, and to keep it abreast of the times, and in the most useful form, by the purchase of important publications as they shall appear, and by the proper indexing of periodicals and pamphlets.

6. To secure a botanical museum, containing material needed for study or calculated to advance general or special knowledge of botany.

7. To direct the main energy of research for the present toward assisting in the completion of a systematic account of the flowering plants of North America, by the publication of monographs of different Orders and Genera, illustrated when this may seem desirable; and to specially cultivate representatives of such groups for purposes of study.

8. To gradually acquire and utilize facilities for research in vegetable histology and physiology, the diseases and injuries of plants, and other branches of botany and horticulture, as special reason for developing one or the other may appear

9. To make the facilities of the Garden useful in botanical and horticultural instruction, as they increase and opportunity for such work appears: meantime, in all feasible ways, to attract to the School of Botany students of promise, and to provide for their instruction and the best use of their time as investigators.

10. To take steps looking to the early appointment of six "garden pupils," — youths with at least an elementary English education, who shall be regarded as apprentices in the Garden, working under the direction of the head gardener and foremen, and shall hold scholarships yielding $300.00 per year each, together with free lodging near or in the Garden, and free tuition in the School of Botany, and who, after having worked for six or more years (as shall ultimately prove best) in the different departments of the Garden, and proved proficient in its practical work, may be admitted to examination for a certificate of proficiency in the theory and practice of gardening.

11. To have in mind, in appointing associates for the Director, their special aptitude in some one of the branches indicated above, so that with each appointment the efficiency of the institution for instruction and original work may be broadened and increased.

On assuming control of the Garden, the Board soon saw that the large amount of unimproved real estate which fell to their care, and which was unproductive and at the same

time a source of present expense and of anxiety as to its future, since very expensive street improvements were likely to be ordered at any time, would necessitate great economy in the management of the Garden for some years; and it was early felt to be imperative that the annual expenditures should be closely limited to what was necessary for the maintenance of the Garden as it then existed, making provision for a very gradual development along certain of the lines indicated in Mr. Shaw's will, and embraced in the outline policy adopted by the Board, while leaving others for future attention, so that with as great rapidity as possible a reserve fund might be accumulated, sufficiently large to provide for the emergencies which were likely to arise in connection with the unimproved real estate. This policy, since the principal of the endowment could not be used, was obviously also the only one which would render possible the expenditure at any one time of considerable sums in effecting permanent improvements and extensions at the Garden, which it was easy to foresee would be necessary within a comparatively few years. Therefore, while the expenditures for the first two years after the organization of the Board were high, because of the necessity for immediate and extensive repairs in many directions, the annual amount available for maintenance expenses* was soon limited to $30,000.00, to which, however, has been added each year, by special appropriation, such sum as seemed absolutely necessary for extensions and improvements which could not be deferred without detriment to the institution.

From the reports of the officers of the Board, as published in the annual Reports of the Garden, has been prepared the following tabulation of maintenance expenses:—

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* Rept. ii. pp. 8, 16.

A WINTER SCENE.

SUMMARY OF EXPENSES.

ACCOUNT.	1889 (5 mos.)-1890. (Second Report).		1891. (Third Report).		1892. (Fourth Report).		1893. (Fifth Report).		1894. (Sixth Report).		1895. (Seventh Report).		1896. (Eighth Report).	
GARDEN.														
Labor*	$18207.48		$20192.37		$16582.92		$15537.70		$14096.62		$13321 92		$13343.30	
Office Assistance	.....		.....		.....		.....		.....		.....		520.33	
Fuel	1099.94		1066.81		1148.29		1487.00		1582.87		1275 52		818.48	
Stable & implements	578.50		813.79		802.00		598.18		604.44		374.95		859 11	
Repairs & supplies	8420.15		7701.46		2839.32		2371.45		1849.37		1920.45		2186.16	
Plants & seeds	622.29		1020.49		736.43		618.35		284.08		1532.27		1194.73	
		$28928.36		$30794.92		$22108.96		$20612.68		$18417.38		$18425.11		$18922.11
HERBARIUM†		5208.91		3199.76		502.07		1418.41		860.51		1191.82		2276.87
LIBRARY		5532.38		4261.36		1602.78		4443.52		2614.90		4975.42		4461.17
OFFICE‡		6932.47		5174.25		5446.50		4609.06		5362.54		4889.32		4798.48
RESEARCH‡		.....		.....		.....		.....		475.50		871.10		1011.37
SCHOLARSHIP*		2467.06		1402.62		445.87		560.11		767.44		650.09		804.15
TOTALS		$49069.18		$44832.85		$30106.18		$31643.78		$28498.27		$31002.86		$32274.15
SPECIAL IMPROVEMENTS	Water pipe & residence,	$9805.18	Residence,	$11785.35	Library cases, etc.	$2806 06	Library cases, etc.	$255 37	Greenhouse and ponds,	$5135.25	Gatehouse, etc.	$10985.52	Extension & storm repairs,	$4986.11

*Up to 1892 the wages paid to garden pupils appeared as an item of scholarship expense, but since that date this expenditure has been carried as a labor item in the Garden Account.

†The large expenditures for the first two years were for mounting the Engelmann and Bernhardi herbaria.

‡Until 1894, research expenses appeared under the Office Account. A part of the office salaries is now charged to Garden Account for various services rendered

While the amount of ordinary repairs carried as a part of the running expense of the Garden has been much smaller since 1892 than before that time, the employment of a more intelligent class of men as vacancies occur, more thorough organization of the labor, and improvement in the methods of caring for the Garden, by which a smaller number of men now do the work, have made it possible, also, to considerably lessen the proper maintenance gardening expenses, although the area of plant-houses has been increased, as well as the number and variety of plants grown; and this has been accomplished not only without a reduction in the wages of the gardeners, but notwithstanding an increase of about 25 per cent. in their wages.

During the year 1896, the ornamental features of the Garden were of the same general character as heretofore, and about the same number of species and nearly the same of individuals were cultivated for this purpose, in the open air, as in 1895. The house collections, on the other hand, especially that of orchids, have been considerably increased, both in size and variety. A conservative estimate by the Head Gardener shows that at present about two and one-half times as many species and named varieties of plants are cultivated as in 1889. At the end of 1895,* an inventory of the plants in cultivation at the Garden showed that 3921 named species and varieties, other than annuals, were cultivated at that time. During the past year, while considerable additions have been made, it is probable that certain species have dropped out of cultivation, so that in the absence of a special inventory it is possible to state merely that the number now in cultivation is unquestionably somewhat greater than that in 1895. As has been done in previous years, surplus bedding and plant-house material has been donated in considerable quantity to public kindergartens, hospitals, mission schools, and similar charities, something over 1500 plants having been so distributed. As

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* Seventh Report, 14.

in the last few years, the impossibility of transmitting seeds and plants to foreign gardens, through the mails, has made it almost impossible to distribute seeds to such correspondents, and, as a result, only a few packets have been sent off. During 1896, 241 consignments of plants and seeds were received at the Garden, of which 175 consignments, aggregating 3967 plants and packets of seeds, valued at $515.00, were donated or sent in exchange for Garden material.

It is estimated that, for various temporary reasons, the number of visitors to the Garden during 1896 was scarcely as large as in the preceding year. On the open Sunday afternoon in June, 10,598 persons passed the gate, and on the corresponding Sunday afternoon in September, 13,589 visitors were counted. So far as estimates can be made from the data at hand, the number of visitors to the Garden is now about one-half greater than in 1889, though, as no automatic register of visitors is kept at the gate, the estimates are not accurate. The multiplication and improvement of car lines by which the Garden can be reached make it probable that the increase noted will continue.

While many difficulties are encountered in securing the correct and permanent labeling of the collections of living plants, the gardeners are gradually coming to understand the necessity of care in preventing labels from becoming lost or separated from the plants to which they pertain. A considerable part of the time of an intelligent man is given to writing labels and supervising labeling, and by far the greater part of the collection is now fairly well and accurately labeled, the names adopted in the Index Kewensis being in the main employed, in accordance with the rules of the Society of American Florists * and a report adopted by the Madison Botanical Congress of 1893.†

Though the gardening features have this year been main-

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* Proceedings Socy. Amer. Florists, 1893, 91; American Florist, Aug. 17, 1893; Florists' Exchange, 1893, 730, 732.

† Proc. Madison Bot. Congress, 1893, 41.

tained, on the whole, in as creditable a manner as in 1895, in some respects the Garden has not been as attractive to the casual visitor as it was the year before. As a result of the most destructive hailstorm that has ever been experienced at the Garden, some 6,000 lights of glass were broken on the 21st of May last, the falling glass doing incalculable damage to many of the plants, which were further exposed to the weather for a considerable time. Cacti and other plants which are sheltered under glass during the winter, but which had been placed in the rockeries and elsewhere before the storm, were either destroyed or so badly bruised that it is impossible even yet to count the final loss. Some idea of the force of the falling hail may be obtained from the statement that the ribbed glass on the roof of the Linnean house, nearly a quarter of an inch thick, was in considerable part broken.

Closely following this storm, the tornado of May 27, which caused great loss of life and property in and about St. Louis, devastated a considerable portion of the Garden. While the grounds, fortunately, were not actually traversed by the cyclonic funnel, but were exposed only to the strong northwest gale which accompanied it, the violence of the wind was such that a number of the structures on the grounds were either unroofed or totally wrecked, while some 450 trees, many of them of large size, were wholly or practically destroyed, and a large percentage of those left standing were seriously broken. A more graphic view of the destruction of trees may be obtained from the statement that 186 cords of firewood have been prepared from the more workable trunks and larger branches of the trees removed. Aside from the direct injury, it is probable that no small number of those left have suffered from unwonted exposure to the strong sunlight of last summer and the winds of the present winter, so that many more are almost certain to require removal during the next year or two. It has been necessary to expend all told $4,479.36 in such storm repairs as could be made, and the loss in

AFTER THE TORNADO.

specimen plants cannot be expressed in money. Furthermore, in addition to these direct storm repairs, a considerable increase has been made necessary in the ordinary maintenance expenses during the past season. But on the whole, there is reason for great congratulation that the Garden did not fare far worse, since its library and herbarium, because of the energetic action of my assistants, were practically uninjured, its greenhouses were soon renovated, and enough trees escaped to prevent the grounds from appearing ruined.

When the Board assumed control of the Garden, a small museum, containing both vegetable and animal material, was found open to the public; but as this had long been without the attention of a curator, the material proved to be in so dilapidated a condition as to require the closing of the museum. During 1890 and 1891, in the absence of other available quarters, the office of the Director was maintained in his residence, and this museum building was devoted to the housing of the herbarium and library, tables being provided in it for those who were engaged in research work. In 1891, in compliance with the will of Mr. Shaw, his city residence was removed from its site at Seventh and Locust streets, and, after careful consideration by the Board, was reconstructed in an essentially fire-proof manner within the Garden inclosure, and this building has been used for office, herbarium, library and laboratory purposes since the end of that year, the intention being that it shall ultimately form part of an extensive system of fire-proofed structures devoted also in part to museum purposes.

During the period of time covered by this report, the herbarium has increased from 159,046 unmounted specimens, constituting the Engelmann and Bernhardi * herbaria,

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* In answer to questions already asked by friends of the Garden, and to remove doubt which may subsequently arise, it may be stated that this is the herbarium of Professor Johann Jakob Bernhardi, who was born in

to 258,629 mounted specimens, protected by impregnation with corrosive sublimate. The present composition of the herbarium, in which 10,793 specimens derived by purchase and 5,674 specimens received as donations or in exchange have been incorporated in 1896, and from which 1,061 unmounted duplicates have been distributed, is as follows: —

The Engelmann herbarium (all groups), about.....		97,800	specimens.
The general herbarium of higher plants: —			
The Bernhardi herbarium.....	61,120		
Other specimens.....	80,843		
		141,963	"
The collection of Thallophytes: —			
The Bernhardi herbarium.....	126		
Other specimens.....	18,740		
		18,866	"
Making a total of about.....		258,629	"
Valued at.....		$25,862	90

Practically as part of the herbarium, the following material is noted: —

Wood specimens of various sizes.....	1,027,	valued at	$100	00
Wood veneers, by Spurr, Hough, Nördlinger and Michel.....	2,229	"	" 150	00
Microscope slides, by Hough, Penhallow, Munroe, and others.....	1,051	"	" 250	00
Together.....	4,307	"	" $500	00

Erfurt, Germany, in 1774, and who died at Erfurt in 1850. Further information about the herbarium can be found in the earlier Garden Reports (ii. 25; iii. 15; iv. 12; v. 15; vi. 15; vii. 17), and in the Transactions of the Academy of Science of St. Louis, vol. i. page 316. At the Royal Botanical Garden at Berlin, Germany, is also a Bernhardi herbarium, formed, however, by a different person, namely Theodor Bernhardi, born in 1810, died in 1889, who, as I learn by a letter from Dr. Urban, was also a resident of Erfurt.— See also Engler's Bot. Jahrbücher, xiv. Beiblatt, Heft 4, p. 37.

The library, which at first contained considerably less than 5,000 volumes and pamphlets, has increased to:

Pamphlets	12,848			
Books (general)	9,885	valued at		$36,144 23
Books (Sturtevant Prelinnean library)*	463	"		2,315 00
MS. volumes (Engelmann)	60	"	"	600 00
(Roetter)	1	"	"	100 00
Total	23,257	"	"	$39,159 23
Index cards	165,969	"	"	$1,659 69

During the past year, 219 volumes and 702 pamphlets, valued at $539.55, were donated to the library, and 571 volumes and 1,216 pamphlets were purchased, $3,310.45 having been expended for purchases and binding for the library. The index has been increased during the past year by the incorporation of 19,912 cards, of which 5,350 were purchased, and the remainder written by the Garden indexers.

Notwithstanding the provision of safe and, for the time being, ample quarters for the library and herbarium in the reconstructed city residence, it has not yet been found practicable to remove the numerous wood specimens, and other unattractive but necessary and valuable material, from the old museum building, so as to free the latter for other uses, nor has it proved possible to spare funds for the purchase of material and the salary of an assistant who should be charged with the installation and maintenance of a museum illustrating some branch of pure or applied botany, such as might be accommodated in this small building were it empty.

Aside from an increase in the plant-houses, and the accumulation of books, living and preserved specimens of plants and their parts, and a small collection of insects, no considerable facilities for research have been acquired at

* Reports iv. 14; v.16; vi. 16; vii. 18, 123–209.

the Garden thus far, the instrumental equipment of the School of Botany being found available for all necessary use by the few Garden employees and pupils, and, as yet, no properly equipped permanent laboratory rooms have been provided, adequate temporary provision being made in the herbarium building and the plant-houses for such work as has been undertaken. While in some respects much remains to be done, such facilities as have been secured thus far have been placed at the disposal of investigators, of whom one or more have occupied tables at the Garden for a period of from one month to a year, each season for several years past, three such investigators having been accommodated at the Garden during the current autumn and winter. By direction of the Board, a general announcement is made, by a widely distributed circular, in the early part of each year, that such facilities as the Garden possesses or can readily acquire for any worthy piece of investigation, are freely placed at the disposal of competent investigators.

For three years the Garden subscribed for a table at the Marine Biological Laboratory, at Wood's Holl, Massachusetts, as a means of securing the use of facilities for seaside study that it was impracticable to obtain otherwise, and the table was used during the summers through this period by Professor M. A. Brannon, who was thus enabled to accomplish an interesting and valuable piece of work on the life-history of one of the marine algae; but as no employee of the Garden could be spared for summer work at the sea-shore, it was deemed best, in 1895, to withdraw this subscription and apply the money directly to the home needs of the Garden.

While, for the reasons already stated, which have necessitated the most economical management possible of the Garden, the organization which has been effected has been the simplest which would insure the efficient maintenance of the grounds and a reasonable growth in the library and herbarium, the explicit statement of Mr. Shaw, in the fifth

paragraph of the second clause of his will * "that scientific investigations in Botany proper, in vegetable physiology, the diseases of plants, the study of the forms of vegetable life, and of animal life injurious to vegetation, experimental investigations in horticulture, arboriculture, etc., are to be promoted," has not been lost sight of. From the first, such small part of my own time and of the time of my assistants as could be spared from necessary administrative and curators' work has been devoted to research, as a result of which a number of papers of greater or less extent have been published. An enumeration of such publications as have issued from the Garden or have resulted, in the main, from work done at the Garden since the organization of the Board, will appear elsewhere in the Eighth Report.

To provide a channel for the suitable publication and distribution of such papers, it was early decided by the Board to regard the historical volume issued in 1890 † as the first of a series of annual reports.‡ These volumes at first contained the official administrative reports, a detailed account of certain annual events provided for in the will of Mr. Shaw but not directly concerned with the Garden, and such scientific papers as might have been prepared during the year. Shortly before the sixth volume was issued, after a careful re-examination of the entire question of publication, and a decision by the Board that it was not only proper but desirable that the Garden should continue the printing of annual reports and memoirs, it was decided that, except when specially ordered published,§ the anniversary reports should be omitted from the annual volume,

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* First Report, 37.

† "The Missouri Botanical Garden."—Commonly cited as the First Report, or the Report of 1890.

‡ Second Report, 8; Third Report, 3.

§ As, for instance, was the case with the able address of President Henry Wade Rogers, —Seventh Report, 113.

leaving the latter as a presentation of the administrative and scientific results attained each year.*

From the Secretary's annual printed statements it appears that the cost of publishing and distributing the annual Reports thus far has been as follows:—

1890.	1891.	1892.	1893.	1894.	1895.	1896.	Total.
$1,493 65.	$1,465 05.	$1,820 61.	$2,272 09.	$1,849 87.	$1,275 81.	$2,848 46.	$13,025 04.

This expenditure, averaging $1,860.72 per year, which includes the expense of a reissue of the first volume in 1893, and of the second and third volumes in 1896, has secured a first edition of 1,500 copies of each Report, and 500 copies of each reissue, enabling us to place sets in nearly or quite all of the centers of botanical research in the world, while the provision of a few hundred reprints of each of the more important scientific articles has rendered it possible for any botanist who really cared to use them to obtain the latter.

While wasteful distribution of the Garden publications has been avoided, as far as possible, and the Reports have been sent to permanent libraries, rather than individuals, except where special reason to the contrary existed, direct payment or an exchange equivalent is not demanded where there is reason to believe that they will be preserved in accessible places or used in serious botanical study. As a result of this policy, it is believed that papers published in the Garden Reports are within the reach of more working botanists than those printed in any other publication, at any rate on this side of the Atlantic.

Notwithstanding the liberal policy adopted in the distribution of the Garden publications, the object being to render them accessible wherever they were likely to be useful, rather than to see that they were not a source of expense to the Garden, they have now become the recog-

* Sixth Report, 8.

nized source of library and herbarium donations, the value of which, as estimated in the Director's reports for several years past, is as follows:—

	HERBARIUM.*	LIBRARY.†	TOTAL.
1893	$324 75	$609 05	$933 80
1894	219 70	931 60	1,151 30
1895	284 15	799 97	1,084 12
1896	230 65	539 55	770 20
Average	$264 81	$720 04	$984 85

Ignoring as a separate item the reprints which have been issued from the Reports, as being relatively inexpensive (though the cost is included in the cost of reports above given), an analysis of the publication account shows that for an expenditure of $13,025.04, 12,000 copies of the Reports have been printed, making their average cost $1.09 each. About 2,800 copies now remain for future use, so that the actual cost to the Garden of the accessions reported above is $9,985.86, or an average of $1,426.55 per year.

In addition to the Reports, in 1893 the Garden issued, for the convenience of visitors, a small handbook, attractively illustrated and bound in leatherette, stating in a concise form the history of the establishment, and indicating a few of the features of interest. By instruction of the Board, this handbook has been offered for sale by the gate-keeper, at the approximate cost of publication, namely 25 cents per copy.

In the fourth paragraph of the second clause of his will,‡ the founder of the Garden declares his intention "that instruction to garden pupils shall be attended to, both in practical and scientific horticulture, agriculture and arboriculture." From certain manuscript memoranda left by him, it appears that Mr. Shaw's intention was, at the first,

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* Valued at the low rate of $5.00 per hundred specimens.

† The valuation arbitrary and inexact, but in the main lower than the average selling prices of comparable books and pamphlets.

‡ First Report, 37.

to endow six scholarships for such pupils, lodging the latter at Garden expense, making them a certain cash allowance each year while they remain at the institution, and giving them all necessary opportunities for both theoretical and practical instruction. Guided by these directions and suggestions, the Board, in 1889, created six such scholarships,* at first fixing the course of study at six years, but afterward † shortening it to four years.

The present status of the course for garden pupils is indicated in the following eighth annual announcement, which is reprinted from a pamphlet issued in November, 1896:—

In accordance with the intention of its honored founder, the Trustees of the Garden offer theoretical and practical instruction for young men desirous of becoming gardeners. It is not intended at present that many persons shall be trained at the same time, nor that the instruction so planned shall duplicate the excellent courses in agriculture now offered by the numerous State Colleges of the country, but that it shall be quite distinct and limited to what is thought to be necessary for training practical gardeners.

To this end, resolutions were adopted by the Trustees, at a meeting held on the 19th of November, 1889, and amended at a meeting of March 9th, 1892, as follows:—

"*Resolved*, That there be established the number of six scholarships for garden pupils of the Missouri Botanical Garden, to be available on and after April 1, 1890, such scholarships to be awarded by the Director of the Garden on the results of competitive examination, except as hereinafter provided, to young men between the ages of 14 and 20 years, of good character and possessing at least a good elementary English education; each scholarship to grant such privileges and be subject to such conditions as are provided below or may subsequently be provided by the Trustees of the Garden.

"Until otherwise ordered, two such scholarships shall be reserved for candidates to be named by the State Horticultural Society of Missouri, and the Florists' Club of St. Louis, respectively; provided, that such candidates shall be given scholarships only after passing satisfactory preliminary examinations, and shall be subject after appointment to all tests and regulations prescribed for other candidates and pupils, and that if the names of such candidates are not presented by the Societies designated, within sixty days after such action is requested by the Director, the vacancies may be filled by him on competitive examination, as in other cases.

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* First Report, 94. † Fourth Report, 17.

AQUATICS.

"Each scholarship so conferred, may be held by the original recipient for a period not exceeding four years, subject to the following conditions:—

"Each garden pupil shall be required to lead a strictly upright and moral life, and shall be courteous and willing in the performance of all duties prescribed for him. He shall devote his entire time and energy to the labor and studies prescribed for him, except that from time to time he may be granted leave of absence to visit his home or for other good reason, at the discretion of the Director, provided that the aggregate of such absences in any calendar year shall not exceed thirty days. He shall also show such ability in his work and studies as to satisfy the Director that it is advantageous for the scholarship to be held by him; and from time to time he may be subject to both theoretical and practical examinations, or may be given special tasks calculated to test his knowledge or resources. Failure to meet the requirements in any one of these respects, making due allowance for extenuating circumstances, shall forfeit all claim on any scholarship, which may then be awarded to another person in the prescribed manner.

"Garden pupils, appointed as above indicated, shall be regarded as apprentices in the Botanical Garden, and as such shall be required to work in it under the direction of the Head Gardener, performing the duties of garden hands. They shall be successively advanced from simpler to more responsible tasks; and, in such order as may seem best, shall be transferred from one department of the Garden to another, until they shall have become thoroughly familiar with the work of all.

"To the end that garden pupils shall be repaid for their services to the Garden, and that the absence of pecuniary means need not deter any young man from obtaining such training as is contemplated, each regularly appointed garden pupil holding a scholarship shall be entitled to the following wages, payable in equal installments at the end of each fortnight: For the first year, $200.00; for the second year, $250.00; and for each year after the second, $300.00; together with plain but comfortable lodgings convenient to the Garden.

"In order that they may have opportunity to become instructed in the theoretical part of their profession, and in subjects connected therewith, such pupils shall not be required to do manual work in the Garden for more than five hours per day after the first year, devoting the remainder of their time to the study of horticulture, forestry, botany and entomology, under the direction of the Director of the Garden; and they shall for this purpose be granted free tuition in the School of Botany of Washington University. They shall also receive practical instruction in surveying and book-keeping, so far as a knowledge of these subjects is held to be necessary for a practical gardener charged with the management of an estate of moderate proportions.

"At the expiration of four years, the holder of a scholarship, who is recommended as practically proficient, shall be entitled to examination by the Garden Committee, in the subjects prescribed for study, and on passing such examination to the satisfaction of the Committee and Direc-

tor, he shall receive a certificate of proficiency in the theory and practice of gardening, signed by the Chairman of the Garden Committee and the Director of the Garden."

Under the above provisions, the following eighth announcement is made:—

One scholarship will be awarded by the Director of the Garden, prior to the first of April next. Vacancies which may subsequently arise will be filled annually, after published announcement.

Applications for this scholarship, to receive consideration, must be in the hands of the Director not later than the first day of March. The preliminary examination will be held on Tuesday, March 9th, at the Botanical Garden, St. Louis, at 10 a. m. If there is more than one applicant, competitive examinations, based on the subjects indicated below, will be held at the same place on Friday and Saturday, March 12th and 13th.

Candidates who live at places remote from St. Louis, and who wish to be spared the expense of coming to the city for examination, may send with their application the name and address of the principal of the nearest high school or of some approved private school, in case he is willing to take charge of such examination for them; but all applications of this character must be in the hands of the Director not later than the middle of February. If the examiner is approved, papers will be sent to him before the date set for the examination, and on the payment of a fee of $2.00 to him, the candidate may write on them in his presence on the day specified. If competitive examinations are also required, the same examiner will receive the papers for them in time to submit them to the candidate on the date set for similar examinations in St. Louis, on receipt of an additional fee of $3.00 as a partial payment for his time in conducting the examination. The papers written on such examinations will be forwarded by the examiner to the Director of the Garden, who will read them in connection with those written in St. Louis, before making any awards.

The successful candidate will be started in his duties as a garden pupil on Friday, April 2d, at the Botanical Garden.

All applicants for scholarship, whether named by the Societies indicated above or not, are examined in the following subjects, so far as they are taught in the upper classes of grammar schools: English grammar, reading, writing and spelling; arithmetic; and geography.

Whenever the number of candidates for scholarships exceeds the number of scholarships to be awarded, all candidates except those named by the Societies indicated, are required to pass a further competitive examination, covering history of the United States, English literature, algebra, German, the elements of botany, zoology, and physiology, and such other subjects as may from time to time be prescribed. It is not intended to make the passing of examinations in these last-named branches a requirement for the award of scholarships, but merely in this way to obtain a means of selecting the most deserving and able candidates when it is necessary to reject some. Hence, the Director will always use his discretion as to the importance to be attached to

greater or less proficiency in any of the subjects covered by competitive examinations, as well as to the other qualifications of candidates admitted to such examinations.

Scholarship pupils are lodged free of cost in furnished rooms in a spacious dwelling adjoining the Garden, under the charge of an employee of the Garden. Table board is not supplied, but wholesome food can be obtained in the lodge at reasonable cost (at present, $13.00 per month). The lodge contains a reading-room supplied with the more valuable horticultural and agricultural papers, and also with a small but standard collection of books on the same subjects, which the pupils have free use of, and under needful restrictions they are permitted to make reference use of the general library of the Garden, which already comprises some 10,000 volumes and 10,000 pamphlets relating to all branches of pure and applied botany. So far as possible, the surroundings of pupils are made home-like, and, without assuming any responsibility for their behavior, an effort is made to subject them to influences calculated to insure for them gentlemanly manners and habits of industry and investigation.

During the first year of their scholarship, garden pupils work at the practical duties of the Garden nine or ten hours daily, according to the season, the same as regular employees of the Garden, and are also expected to read the notes and articles referring to the subject of their work, in one or more good journals. After the first year one-half of each day is given to manual work, the remainder being devoted to class work as outlined in the appended table.

The 76 class exercises per week here tabulated (each extending over three months), may be grouped under subjects as follows:—

Gardening:			
Floriculture	8		
Vegetable gardening	4		
Fruit culture	8		
Forestry	3		
Landscape gardening	3		
Selected thesis work	4	30	
Surveying and drainage		6	
Bookkeeping and accounts		4	
Economic entomology		5	
Botany in its relation to gardening:			
General botany	8		
Botany of decorative plants	5		
Botany of hardy woody plants	3		
Botany of fruits	2		
Botany of vegetables	1		
Botany of weeds	1		
Economic mycology	7		
Vegetable physiology	4	31	76

COURSE OF STUDY.

YEAR.	TERM.	STUDIES.					PER WEEK.
SECOND.	April to June.	Floriculture. 3 exercises weekly.	Economic Entomology. 1 exercise weekly.		Surveying. 2 exercises weekly.		6
	July to Sept.	Floriculture. 3	Economic Entomology. 2	Book-Keeping. 1			6
	Oct. to Dec.	Floriculture. 1	Economic Entomology. 2		Surveying 1	Elementary Botany. 3	7
	Jan. to Mar.	Floriculture. 1	Twigs of Woody Plants. 1	Orchard Culture. 1	Landscape Gardening 1	Elementary Botany. 3	7
THIRD.	April to June.	Vegetable Gardening 4			Landscape Gardening 1	Elementary Botany. 2	7
	July to Sept.		Economic Mycology. 1	Orchard Culture. 2	Landscape Gardening 1	Botany of Garden Flowers. 2	6
	Oct. to Dec.		Economic Mycology. 3	Garden Accounts. 1	Botany of Fruits. 2		6
	Jan. to Mar.		Economic Mycology. 3		Botany of Weeds. 1	Botany of House Plants. 2	6
FOURTH.	April to June.	Orchard Culture. 1	Forestry. 1	Book-Keeping. 1	Surveying and Drainage. 3		6
	July to Sept.	Small Fruit Culture. 4				Botany of Vegetables 1	6
	Oct. to Dec.	Special Gardening 2	Forestry. 1	Vegetable Physiology 2		Botany of Woody Plants. 2	7
	Jan. to Mar.	Special Gardening 2	Forestry. 1	Vegetable Physiology 2		Botany of Ferns. 1	6

All of the above subjects capable of being taught in the laboratory, the greenhouse, or the field, are so taught, and all of the theoretical instruction is expected to be practically tested in the performance of the manual work required of students, the object being to make practical

gardeners and not botanists or other scientific specialists of garden pupils.

The second year's work only is now given each year, while the work of the third and fourth years is given alternately to two combined classes.

Vacations are granted from July 1 to 15, and December 21 to January 4, inclusive.

By the further action of the Board of Trustees taken at its meeting of November 16th, 1894, the Director is authorized "to admit, in addition to those holding garden scholarships, as many suitably prepared garden pupils as can, in his judgment, be adequately taught without material increase in the cost of tuition, each pupil so admitted to be charged $25.00 per year tuition, and to be entitled to the same certificate as a scholarship pupil on completion of the prescribed course and examinations."

In conformity with this action the Director is prepared to consider applications from persons desirous of entering the Garden next April as pupils *without any of the scholarship grants or payments*, and subject to the payment of a tuition fee of twenty-five dollars at the beginning of the class year, namely on or about the first of April, each year. Such candidates will be examined on the grammar school studies mentioned on page 28, as required of all scholarship pupils, and will be entitled to take such examinations at a distance from St. Louis in the manner indicated on page 28, if they so desire. Pupils of this class, as well as those holding scholarships, will be received only with the understanding that they expect to complete the full course of four years, and in case a pupil is obliged for any reason to leave the Garden, he will not be entitled to a refund of any part of the tuition fee for the year.

Applications for scholarships, or inquiries concerning admission to the Garden as pupils, are to be addressed as below, on or before the dates mentioned on page 28. If required, blanks will be mailed to persons who contemplate making application for scholarships.

WILLIAM TRELEASE, Director,
Missouri Botanical Garden,
ST. LOUIS, MO.

Most of the pupils first appointed were either too far advanced in practical gardening experience, or too anxious to enter upon the duties and responsibilities of life, to make good students, so that only one of those first appointed completed the course. Four others have since received the certificate given on completion of the course of study. While the number is yet too small to permit positive conclusions to be drawn as to the usefulness of the course, it is gratifying to note that two of the pupils have gone to

practical horticultural positions in agricultural colleges on completing their work here, while one, after a season's study in the Arnold Arboretum, has begun a year's further work at the Kew Gardens.

In March, 1896, three pupils completed the course of study and were given certificates, namely, Clyde M. Blankinship, Arthur T. Erwin, and Emil Mische. In conformity with an announcement issued in the preceding autumn, the three vacancies thus created were filled by the appointment of Walter Retzer, of St. Louis (who for some time had been a special student), on the nomination of the Florists' Club of St. Louis, and the appointment of Charles W. Deusner and Cornelius Winther on the results of examination.

At the Horticultural Congress held in Chicago, in 1893, in connection with the Columbian Exposition, the subject of horticultural education was discussed by the Director of the Garden and other persons,* attention being called to the course of study adopted at the Garden. In 1895, at the Pittsburg meeting of the Society of American Florists, a paper of somewhat comparable scope was presented by Mr. Charles Jackson Dawson,† in which the St. Louis course of study was made the basis of comparison. Quite recently, Mr. Emil Mische, one of the garden pupils, who had received a certificate, presented a paper before the Gardeners' and Florists' Club of Boston,‡ in which the work done at the Garden is quite fully set forth. Besides these articles, which are directly concerned with the course as offered at the Garden, a considerable number of appreciative notices have appeared in both the American and foreign press, from time to time.

Although it must be admitted that the instruction of a small number of pupils makes the relative cost of training

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* Florists' Exchange, 1893, 748.

† Proc. Soc. Amer. Florists, 1895, 41.

‡ Printed in the American Florist of Oct. 17, 1896, 244.

each high, there is reason to believe that this provision of Mr. Shaw's will in time will be productive of much good, while if, as is to be hoped, the number of pupils shall be ultimately increased, the results attained by a given outlay can in all probability be considerably augmented. Under the present instructions of the Board, three special students have thus far been admitted, and of these, one, a Japanese gentleman of good elementary training, after remaining at the Garden for a year and a half, was recalled and placed in charge of an important horticultural school which has been established in his native country.

The necessity of keeping the office staff down to the smallest possible limits, has thus far prevented the appointment of permanent associates for the Director, such as were contemplated in the outline policy of the Board quoted above, and it has seemed best to treat the assistants' positions as being virtually fellowships, enabling young men of fair botanical knowledge, but little experience, to fit themselves for more responsible positions while doing the necessary routine work of the Garden. It is gratifying to note that of the four regular botanical assistants appointed before the middle of 1896, two have gone to responsible college positions and one has assumed charge of a branch of the botanical work of the United States Department of Agriculture. The position vacated by the resignation of Mr. Thompson in the summer of 1896 has been filled by the appointment of Mr. J. B. S. Norton, formerly an assistant in the botanical department of the Kansas Agricultural College. Of the three regularly appointed horticultural assistants, one died while in the service of the Garden, where he was doing very efficient work, one has been called to the chair of horticulture in the University of Missouri, while the third, Mr. Irish, is still at the Garden.

Four annual events provided for in Henry Shaw's will have taken place in 1896, as follows: the preaching of a sermon "on the wisdom and goodness of God as shown in the growth of flowers, fruits, and other products of the

vegetable kingdom;" * the seventh "banquet to the Trustees of the Garden" * and their invited guests; the seventh "banquet to the gardeners of the institution, and invited florists, nursery-men, and market gardeners;" * and the award of "premiums or prizes to a flower show," * held in St. Louis.

The flower sermon was preached in Christ Church Cathedral, St. Louis, on the morning of May 17th, by Right Reverend Ellison Capers, of South Carolina.

The Trustees' banquet was given at the Mercantile Club, on the evening of May 1, and was presided over by Mr. Henry Hitchcock, Vice-President of the Board of Trustees, eighty-five representative gentlemen being present. Speeches appropriate to the occasion were made by Hon. F. W. Lehman, Prof. F. Lamson Scribner, of the United States Department of Agriculture, Mr. Alexander G. Cochran, Hon. Jas. O. Broadhead, Prof. Howard Ayers, of the University of Missouri, and Gen. George H. Shields.

The seventh annual banquet to the gardeners of the institution, and invited florists, nurserymen, and market gardeners, was given at the Mercantile Club, on the evening of September 16. Covers were laid for about 125 guests, among whom were the members of the Association of American Cemetery Superintendents, in convention in St. Louis, the gardeners of the Botanical Garden, representative florists, market gardeners and nurserymen of St. Louis, officers and representative members of the Missouri State Horticultural Society and of similar societies of Illinois, the President-elect of the Society of American Florists, a number of representative amateur horticulturists of St. Louis and vicinity, and members of the office staff and Board of Trustees of the Garden. The Director of the Garden presided, and after the dinner appropriate speeches were made by O. C. Simonds, of Chicago, Presi-

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* First Report, 49.

dent of the Association of American Cemetery Superintendents; Hon. Norman J. Colman, late Secretary of Agriculture of the United States; Adam Graham, of Cleveland, President of the Society of American Florists; W. M. Bulkley; Hon. R. Graham Frost; H. C. Irish; and W. M. Chauvenet.

The flower premiums for 1896 were awarded through the officers of a chrysanthemum show held in the Exposition Building, St. Louis, November 11 to 15, the awards in general being made for plants and flowers similar to those entered in previous years. Unfortunately, owing to the absence of suitable entries, it has again proved impossible to award the Shaw medal founded by the Board in 1893.*

The Board of Trustees having become fully convinced that, because of the prejudice against leasing land for residence purposes, it would not be possible to carry out the intentions of Mr. Shaw, as expressed in the first and third paragraphs of the first clause of his will,* they brought suit to the April Term, 1896, of the Circuit Court, City of St. Louis, praying for a decree authorizing them to sell certain of the unproductive real estate; in which suit the State of Missouri, by its Attorney-General, as guardian of the public interests, and all of the heirs at law of Henry Shaw, were made defendants. On June 8, the cause came on for hearing, the Attorney-General appearing in person, and was submitted to the court upon full proofs, and on the 17th of August a final decree was handed down, by which the present Trustees and their successors in trust are authorized and empowered to sell certain specified revenue real estate,

—"on such terms and conditions as they may from time to time deem advisable, at public or private sales, and in making such sales said trustees are authorized, empowered and directed in and by the deeds to be executed by them, to impose such restrictions and conditions as may be found practicable, as to the character of the improvements upon said property so sold and the purposes for which the same may be used, so

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* Reports v. 18; vi. 20; vii. 22.

* First Report, 32.

that said property by its contiguity may be pleasant and attractive to the visitors and students of the Botanical Gardens. Said trustees are also authorized in their discretion, before making such sales, to lay out, plat, grade and improve such portions of said tracts as they may deem desirable, as residence parks or districts, with such restrictions as to building lines, cost and character of improvements to be erected by purchasers, and the use to which said property shall be put, as said trustees may deem desirable and appropriate, in order to realize as far as practicable the said intention of said testator as to the surroundings of said Botanical Gardens. Said trustees are also authorized to lay out such streets and alleys as may be necessary to said premises, and if deemed desirable or expedient, to dedicate the same, or parts thereof, as public highways. Plaintiffs and their successors in trust are also authorized and empowered to apply the moneys now on hand, and such of the future revenues of said trust as may be available therefor, or such parts of such moneys or revenues as may be deemed by them expedient, in paying the special taxes and other improvements on said premises, and the proceeds of sale of such premises, when sold, may be applied by them to the payment of special taxes which may be imposed on said tracts, or any of them, of the improvement thereof, or to the special taxes on or to the improvement of other of said tracts not so sold. Such of the proceeds of sale as may not be required for such purposes shall be invested in approved securities or in the betterment, reconstruction or restoration of the income-producing property of the trust, or in the improvement of any of the unimproved property of the trust, and only the income of such proceeds of sale so invested shall be used for the support of the trust."

In view of the important interests involved, the Attorney-General deemed it proper to appeal from this decree to the Supreme Court, in which the cause is now pending; and until that court shall render a final decision, the trustees have not undertaken to exercise any of the powers so conferred upon them.

The accumulation of a reserve fund sufficient to meet the more probable temporary emergencies, and the possibility of exchanging more or less of the unimproved real estate of the Board for productive property, have made possible the contemplation of an increased expenditure for the purposes of the Garden, not only for annual maintenance, but for the permanent enlargement of the grounds and the amplification of the scope of the institution, to bring it into full conformity with the intentions of its founder. In compli-

ance with a request of the Board, in November 1895 a general plan for extension and development was submitted by the Director, and the more essential parts of this report are here quoted, as forming a comprehensive statement of the main ends to be attained.*

GENERAL PLANS FOR PLANTING.

In providing for the future of the Garden, three principal objects must be kept in view: beauty, instructiveness, and adaptability to research. So far as development of the grounds and plant houses is concerned, it seems to me that future extensions and changes should be conducted on essentially the following lines, decided upon definitely in advance, and adhered to as closely in detail as ever-changing conditions may permit, so that each step that is taken is a part of a definite, carefully considered general plan, while the inevitable mistakes can be easily detected and promptly rectified without resulting harm.

For florists' forms, including general transient decorative plants, the present garden, lying along Tower Grove Avenue, and bounded by the fruticetum, the arboretum, and the Director's residence, seems to me to be amply sufficient. This portion of the grounds, which at present constitutes the most attractive part of the Garden, falls far short of what it can be made to be, but its improvement, which is being carried on, is of necessity only partial. To obtain the fullest results from this tract of ground would necessitate what I have no doubt will ultimately be done,—the clearing, to a very large extent, and suitable rearranging and replanting of the entire tract. In this area, comprising some thirteen acres, I think that it will always be possible to cultivate in adequate quantity a sufficient variety of the most attractive decorative plants, many of which are tender and must consequently be propagated anew each year. This portion of the Garden, on which the greater part of the maintenance fund is now spent each year, must always, from this fact, continue to be the expensive portion of the Garden to maintain. To supplement the grounds, a much extended system of greenhouses must also ultimately be provided. A beginning has been made toward this by the erection in 1894 of a house facing the Victoria pond, this house constituting the central portion of a proposed range extending from the present house into palm towers at the east and west, with houses of the general construction of the present one running south from these towers. Whenever the funds of the Board and the general status of the Garden shall warrant it, it will also prove not only desirable, but necessary, to

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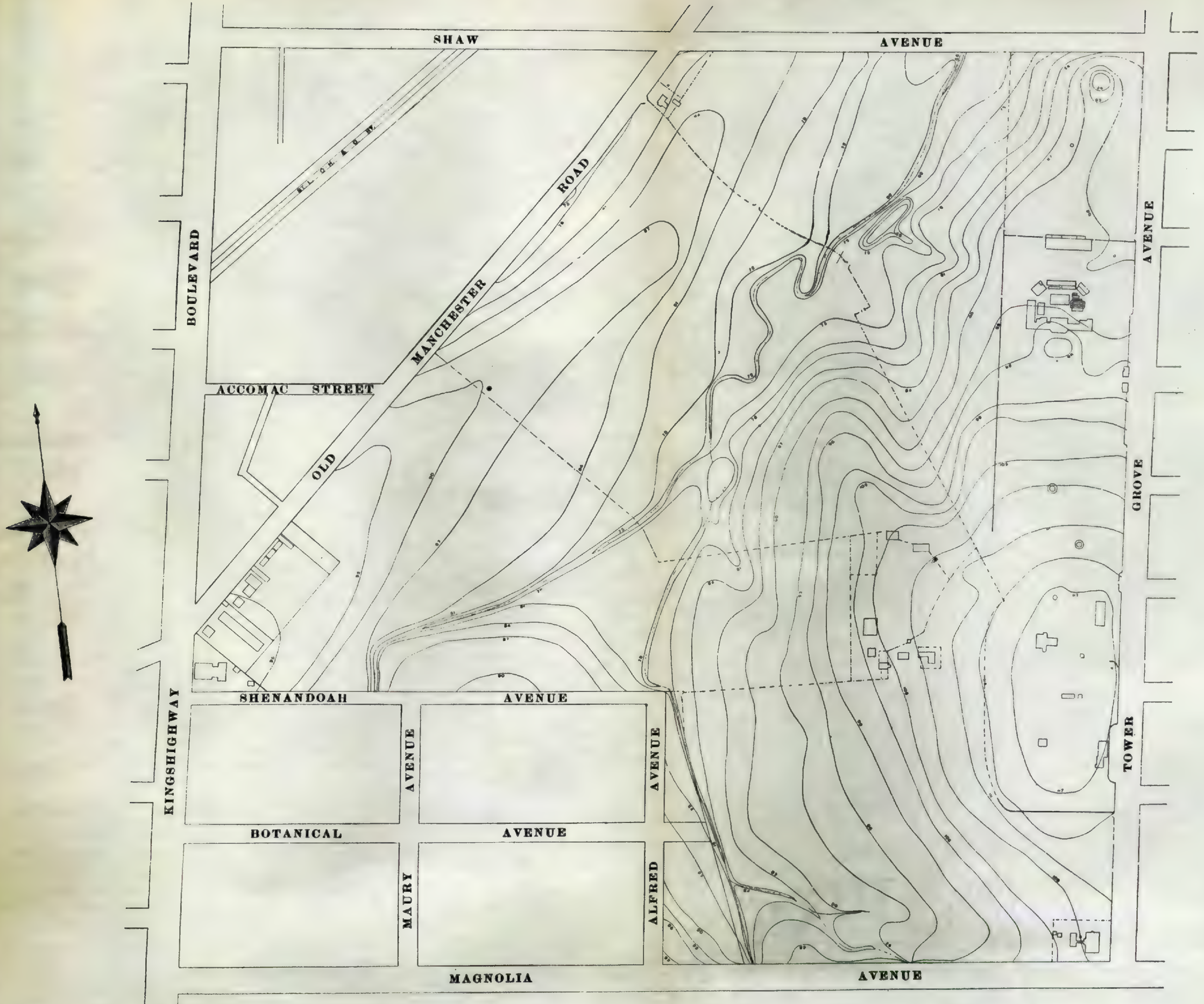
* This report in full was part of the testimony in the suit of R. J. Lackland et al. *vs.* R. F. Walker, Attorney-General, et al., above mentioned. See page 203 of the printed abstract of record in said cause in the Supreme Court of Missouri.

construct a large palm house, in which larger specimens may be grown than in any of the present houses, and to this palm house will ultimately be annexed a rather extensive system of houses of the same general construction as the house built in 1894. With these facilities, granting an adequate maintenance fund and competent gardeners, the floricultural side of the Garden will, I think, be amply provided for.

For horticulture, in the general sense of vegetable and fruit gardening, the fruticetum, the renovation of which was begun in 1890 by the planting of a small collection of trees, which are just coming into fruit, and continued during the past season by the removal of most of the old trees and the substitution of carefully selected young nursery stock, together with the present vegetable garden at the rear of the Director's residence, will serve all necessary purposes, so far as the work at the Garden is concerned. Ultimately, it may prove necessary to acquire suitable orchard and garden property somewhere in the country for the performance of scientific experiments, but there is no reason why land within the present bounds of the Shaw property should be reserved for this purpose in making plans for the future, since experimental work of this kind, should it ever be carried on on a larger scale than is possible on the space now reserved, will undoubtedly necessitate removal from the smoke and soot of the city. For this work the vegetable house and grapery constructed in 1895, in the vegetable garden, can be extended by the enlargement of the present house and the building beside it of several other similar houses, as these may be needed.

For educational purposes, aside from those served by the maintenance of a large and varied collection of named plants, representing those of purely botanical interest as well as those yielding useful products or of decorative value, synoptically arranged groups must be especially planted. Up to the present time, it has been possible to do such planting only in a limited way; but whenever the revenue of the Board shall justify it, it will prove desirable to extend the garden so as to include the part which is now kept as farm and pasture, lying in general to the southwest of the present garden, and bounded roughly by the Manchester Road, Shenandoah Avenue, Alfred Avenue, Magnolia Avenue, and the limits of the present garden. This tract includes some 82.5 acres, of which about 20 acres would be cut off by a line drawn from the southern point of the arboretum to the farm house, and from that extending westwardly to the intersection of Shenandoah and Alfred Avenues. In providing for a future extension of the garden, this tract, which is geographically separable from the remainder of the farm, offers an opportunity for securing at once a very attractive piece of landscape gardening and a synopsis of the flora of the United States. So far as I know, no botanical garden has ever presented a synopsis of the flora of the country in which it is situated, so arranged as to be artistically attractive; and this is perfectly possible in this 20-acre tract extending northwestward from the corner of Magnolia and Tower Grove Avenues. In this tract should be found representatives of all cultivable families of United States plants, comprising the more representative genera and a



B. H. COLBY, 1896.

1 IN. = 400 FT.

CONTOUR MAP OF THE GARDEN AND ADJACENT GROUND, FURNISHING DATA FOR PROPOSED IMPROVEMENTS.

few of the more representative species of each which are capable of successful growth in the climate of St. Louis; but the object should be to avoid the introduction of any exotic species, as well as of too large a number of species native to this country.

The remainder of the present pasture, comprising some 62 acres, should at a subsequent period be planted to represent the flora of the world, so far as this is capable of open air cultivation in our climate, also planted for the greatest possible landscape effect, but, like the smaller tract, synoptically arranged.

Two principal ideas are now prevalent as to the natural affinities of plants: that exemplified in Bentham and Hooker's "Genera Plantarum," representing in the main the views of botanists like Jussieu, the DeCandolles, and Asa Gray, as well as the authors of the work cited; and that exemplified in the "Pflanzenfamilien," now in course of publication by Engler and Prantl. The former is the one most familiar to English, French and American botanists, and for this reason should be followed in the smaller plantation, devoted to the flora of the United States. The sequence of orders in the Engler and Prantl system, however, which is very different from that of Bentham and Hooker, should prevail in the planting of the general synopsis in the larger tract, inasmuch as it represents more closely than the other the phylogeny of the different groups of plants.

In arranging for the planting of these two tracts, which, from the nature of the planting, should be sufficiently distinct one from the other, and yet should merge into each other as a single piece of artistic landscape work, provision must also be made for the stables, compost grounds, and small nursery, necessary for the maintenance of a large garden, and also for certain small synoptical collections which may be called transient synopses, since they need not all be maintained at any given time, one giving place to another after a certain period of years. Such collections would represent medicinal plants, fiber plants, foliage and other economic plants, synopses of the botany of certain literary works, and of the various interrelations between plants and animals,— such, for instance, as a collection illustrating pollination of flowers, dissemination of seeds, climbing plants, carnivorous plants, the sleep of plants, etc., etc. These reservations, which must be centrally located, can be made very well in the vicinity of the present farm house, the synopses extending from this point to the southern apex of the arboretum, the two, properly screened by planting, forming a natural limitation between the synopsis of the American flora and the larger general synopsis, for which there will be left free about 60 acres.

For investigation, aside from the great amount of material which will be found in the plant houses and the grounds, as outlined above, special small groups must be planted from time to time, both in the open air and under glass. For these, which will of necessity be small, ample provision can always be made in the present garden, the fruticetum and vegetable garden, and the annexed greenhouses, without interference with either the object or the effect of these parts of the grounds.

Ultimately, however, as the revenue of the Garden increases, and the

opportunities for research grow, I have no doubt that the occasion may arise for the provision of research adjuncts at a distance from St. Louis, just as has been suggested for horticultural research. Such adjuncts might ultimately comprise a seaside garden for the study of maritime plants; an alpine adjunct, suitably located for the cultivation and study of plants which thrive only at high elevations; an arid region adjunct, where alone can be properly grown and studied in their natural form the cacti, agaves, and other characteristic plants of our southwestern flora; and perhaps ultimately a sub-tropical or tropical extension for similar work on plants which cannot otherwise be seen at their best. All of these, though, are extensions which need not in any way affect the planting and arrangement of the grounds now owned by the Board, and it may be that none of them will need detailed consideration during the lifetime of anyone now connected with the Garden, though they are all strictly within the legitimate purpose of the institution.

SEQUENCE OF STEPS IN DEVELOPMENT.

In realizing a general policy such as has been outlined, and the adoption of and adherence to which I consider very essential to the proper growth of the Garden as a unit, when the possibility of its extension may come, opinions may differ widely as to the order in which the various steps should be taken. To me, however, it seems that there is no question that the first step should be the planting at the very earliest practicable date of the synopsis of the United States flora, occupying a tract which is the most prominently located in the entire area to be improved; and for the last four or five years I have been cultivating this ground, in order to get it into a state of tilth suitable for planting. But before this step can be taken, it is quite essential that the general arrangement of the remainder of the grounds should be decided upon and approximately planned, so that the final result may not be scrappy. Assuming the adoption of the general apportionment of the grounds that I have indicated above, I have worked out detailed plans for the planting of the twenty acres which it is proposed to devote to a synopsis of the North American flora, and have also had my horticultural assistant and one of our senior garden pupils prepare independent ideas for the planting of the same piece of ground,— these plans, which differ in landscape treatment, being all based on the one fundamental purpose of making this tract one which will show the casual visitor as well as the careful student the types and affinities of our native flora.

Should the funds of the Board warrant the annual expenditure of a few thousand dollars, the work of improving this twenty-acre tract of ground can be begun immediately, the first step being of necessity the provision of suitable drainage, which will cost approximately $1,900.00, and (if my plan in its main features should be adopted) grading to the extent of about $3,000.00. It would not be desirable to attempt more than this for the first year, unless the Board felt that it could place the necessary water pipes upon the grounds, the expense for which would probably

be between $2,000.00 and $3,000.00. For the second year, the trees and shrubs needed for the tract could be wholly or partly planted, according to the plan, involving an expenditure of something under $5,000.00. For the third year, the herbaceous plants needed for the completion of the scheme could be planted, rock work and smaller ponds needed for the growth of certain classes of plants provided, and the general surface of the ground smoothed and seeded to blue grass. In the following year, the drives, or so much of them as the available funds would allow, could be made, so that within a period of five years, for an annual expenditure of perhaps $5,000.00, the entire ground could be improved and planted. These figures are entirely rough estimates, but I think that they represent with approximate accuracy the cost of getting the grounds in suitable condition. The annual maintenance of this tract, which in size would about equal the arboretum or the entire remainder of the present garden, including the fruticetum, vegetable garden and private grounds, has not been carefully figured out, but since it is proposed to cultivate in it only hardy plants, doing away with the necessity for the annual propagation of thousands of tender bedding plants, and since there will be large areas of lawn, so situated as to be capable of mowing by horse power, the cost of maintenance will fall very far below that of the present garden, probably calling for the employment of not to exceed five men, or an expenditure of somewhere from $2,000.00 to $3,000.00 per year.

In the meantime, say in 1897, if money could be spared for that purpose, it would be desirable to extend the greenhouse built in 1894 to the eastward, by an expenditure of $3,000.00 to $4,000.00, and in the following year the old and dilapidated little plant house standing obliquely between the agave house and the house of 1894 should be removed, and the latter house extended to the westward at an expense of from $3,000.00 to $4,000.00 additional.

By the time that the United States synoptical grounds were completed, and the trees and shrubs beginning to develop fairly, it would be desirable to suitably fence it on the east, south and west limits. For the east, I should suggest continuing the stone coping with iron pickets from the herbarium building to the grounds now occupied by the lodge, from this point securing the inclosure by the same style of fencing with overhanging wires that has been used between the arboretum and fruticetum and along the north end of the arboretum.

In about six years, this having been done, should the funds of the Board be materially increased, it would be practicable to begin the construction of a large palm house, for which provision has been made in the proposed United States synoptical strip, that being the most suitable site which can be found for such a house, since it is contiguous to Tower Grove Park, and will be suitably exposed to view from both Tower Grove and Magnolia Avenues. Such a house, built on the plans which I have been roughly preparing for a number of years, will cost, when completed, not far from $75,000.00, of which perhaps $40,000.00 can be used at first, the other expenditure to be made within the succeeding years in sums of

from $10,000.00 to $20,000.00 per year. In locating the palm house, to which ultimately will be appended a system of westward extensions, careful attention has been paid to the convenience and economy of managing the plant houses, the sites available for such a palm house, and the effect which such a house can be made to produce in the grounds; and after very careful study of the matter I am convinced that the only other site which would naturally suggest itself, namely, in the arboretum, to the west of the parterre, is quite unsuited because of the surroundings, while the connection of this large system with the present system of houses will not in any way facilitate the work of maintenance nor render possible economy in it.

These plans, which have been sketched in sufficient detail, as I believe, to meet the requirements of the Board, leave the main farm, of some sixty acres, for improvement at an indefinite date in the future, when the means of the Garden shall be very much greater than they now are; but with these improvements, which it is proposed to complete within a period of ten years, it will, I think, rank with any similar institution in attractiveness. By the time the North American synopsis has become fairly attractive, however, it will be possible to effect a radical and wholesale renovation of the present tract devoted to the garden proper, a renovation which it is impolitic to make until another piece of attractive planting has been effected, since for a period of years after grounds have been newly planted they are unattractive, giving promise only of what they are to be.

RESEARCH FACILITIES.

In the plans sketched above, all of the proposed planting and extension of the grounds has had reference to their usefulness for research as well as their instructiveness and beauty. But the great opportunity which Mr. Shaw's large bequest has offered the Board is not merely to secure beautiful and instructive grounds, but to advance the knowledge of botany by the performance of original investigation, and the Garden's success in the future will be measured largely by its attainments in this direction, since the arrangements which have been suggested above are certain to assure beautiful and instructive collections of both hardy and tender plants. Realizing this fully, I have, from the first, made a strong effort to secure all facilities for research work for which money could be spared, year by year, from the available income of the Board, and as a result of this effort the Garden possesses at present a very valuable library and herbarium; and an examination of its annual Reports will show that the small proportion of my time and that of my assistants which could be spared from necessary maintenance and executive routine has been productive of a considerable amount of such work. During the past five years, botanists from a distance have visited the Garden in some numbers, and have made use of its facilities for the performance of similar work, and the collections have always, when possible, been made available to competent investigators who could not visit St. Louis for the purpose of using them (a courtesy which I need hardly say is ex-

tended to the Garden staff by the principal other botanical institutions of the country). This acquisition of research facilities is, nevertheless, a thing which must continue for many years before the Garden is adequately equipped for the performance of such work as the Garden staff and visiting botanists should here find the opportunity for doing, and it is proposed, as rapidly as money can be spared for this purpose, to further extend both library and herbarium. The latter must also gradually be amplified by the provision of material which is too bulky, or otherwise unsuitable for incorporation in the herbarium proper, leading logically to the formation of a museum; and this research museum must, in part, also be arranged so as to become educational.

Mr. Shaw, many years ago, as the Board will remember, erected a building which he called a library and museum building, in which he maintained a collection of botanical and zoological material. At the time when the Board was organized, however, this had become so badly deteriorated that it was no longer a creditable display, and with the consent of the Garden Committee the museum was closed to the public. The limited room available for the work of the Garden staff and the storage of necessary but unattractive museum material, such as wood sections, etc., coupled with the limited sum which could be spared each year for Garden purposes, has compelled me, up to the present time, to keep the museum closed; but in the near future, the provision of an attractive educational museum must receive serious consideration, and it has been given frequent thought during the past six years. Yet it does not seem to me that it is as necessary immediately as the extension of the grounds which has been sketched above, and it is further very seriously complicated by the small size and entire inadaptability of the present building to the proper display of a museum collection. Still, I think that whenever the material which is now in the room can be stored accessibly for preservation elsewhere, a small synopsis of the entire vegetable kingdom, representing by models, drawings and specimens especially the lower groups of plants, which cannot be displayed in the grounds and greenhouses, can be arranged in the present room.

To provide for the extension of the library, herbarium and museum, it is obvious that much more ample buildings than those now on the grounds must ultimately be erected. These it is proposed to cluster about the building now used for the herbarium, in contiguity to that building and to Tower Grove Avenue, so that they will all be conveniently accessible, and in the apportionment of the ground for other purposes allowance has been made for this; and it has been hoped that without interfering with the other plans mentioned above, the proposed synoptical museum could be arranged within two or three years, at a cost of perhaps $3,000.00, while in about four years the funds of the Board might permit of a fire-proofed extension of the library building, costing approximately $15,000.00.

With the growth of the grounds, library, herbarium and museum, it will become necessary to somewhat amplify the very simple present organization of the office staff. At present this consists of the Director,

with a horticultural assistant, a botanical assistant, an artist, an indexer in the library, and an amanuensis. As the facilities for horticultural work increase, however, it will be most desirable to make certain that the man to whom horticultural investigation is to be intrusted shall be a permanent employee, — a thing which cannot be counted on under the present arrangement,— and I shall shortly propose to the Board that the horticultural assistant be given to understand that there is a future for him in the Garden, if he proves worthy of it, and to promise him a definite annual increment in salary; but this is a matter to be considered in detail when the time for action comes. It will also be necessary to appoint a curator for the herbarium within a few years, with the same certainty of increase in salary up to an amount adequate to insure his remaining; and a librarian must also be provided. A curator for the museum, when established, will also be equally necessary, at least so soon as the museum has attained any considerable size.

Such research work as has been done up to the present time, as I have stated above, has been done by the office staff, in leisure hours. With the amplification of this staff, it will be possible for each of the appointees to become a prominent worker in the line of botany with which his duties are most intimately connected, provided he make suitable use of the facilities which the Garden is acquiring for investigation; but as time goes on, it is certain that the income from the Shaw bequest will make it possible to do much more than merely to provide facilities for research and to allow men to take from their necessary routine duties a small proportion of time for the performance of investigation. Perhaps in the entire planning of the future of the Garden there is no other subject deserving of so careful thought as this, for mistakes in the plan adopted may nullify this, which I regard as preeminently the opportunity of the St. Louis Garden.

Several ways exist for securing research when facilities are present. Material which can safely be loaned can be sent from the Garden to competent workers, as is now done. Material which cannot be loaned with safety can be freely placed at the service of visiting botanists, as is also now done; but I fear that the number of people who will annually visit the Garden at considerable personal expense will be comparatively small, because of the fact that nearly all investigators are men connected with university positions, often on small salary, and with no leisure excepting that of their summer vacations. To enable this class of men in any considerable number to utilize the facilities, I think that something more than merely offering them the facilities will be necessary. The greater number of successful colleges of the country have a certain amount of money which is each year expended in scholarships for undergraduate students. Possibly it may be considered desirable, in the remote future, to expend a certain proportion of the Shaw income for the endowment of scholarships in the School of Botany, just as has already been done for the gardening school maintained at the Garden; but any such expenditure will bring a class of men who are not prepared for research, but who come for preliminary training. In some of the wealthier col-

leges there is also a small sum available each year for traveling fellowships. This money is usually expended in such a way as to enable a promising student to continue his studies in Europe, under the direction of a master in the line of study selected by him. Probably, as the funds of the Board increase, the expenditure of a very few thousand dollars annually, in small grants of two or three hundred dollars each, may make it possible for investigators with partly completed work to come to the Garden and here complete their work during their summer vacation, while the endowment of a number of research fellowships, yielding perhaps $1,000.00 per year, may make it possible for such men to come to the Garden for an entire year for similar work. These three possibilities, while they are probably located far in the future, are worthy of careful thought, so that when the possibility of action comes they may be judiciously acted upon.

Any investigation promoted in this way is most desirable, and is, as I interpret them, strictly within the purposes of the founder of the Garden, but it must not be overlooked that while such provisions will contribute to the advancement of botany, they do it indirectly, so far as the Garden is concerned, by enabling others to utilize what the Garden has acquired for such work. If the Garden itself is to become known as a center of investigation, it will be absolutely necessary to provide for the performance of a considerable amount of such investigation by the regular Garden staff, and this leads me to believe that as the institution develops it will not only be desirable but necessary to appoint, one after the other, young men of extreme promise who wish for a position which will enable them to do research work, and who, given this opportunity, will ultimately become leaders in their specialties. To secure such men, who can be appointed at a low salary, say of $1,000.00 to $1,500.00 each, it will be necessary to promise them that, if successful, their salaries will increase up to a suitable living salary, which in all probability will be dictated by the salaries usually paid by the universities of the country, since an investigator, as well as a teacher, must secure a living if he is to devote his time to investigation. I hope to live to see the income of the Garden so ample that it shall claim among its regular employees men recognized as the equal of any in the country, if not in the world, in horticulture, vegetable physiology, morphology, paleo-botany, phanerogams, pteridophytes, bryophytes, fungi, algae and lichens.*

Ultimately it is very possible that the money available for research work will admit of the employment in the same manner of an entomologist, and there is a possibility that in coming generations other branches of zoology may be represented, either directly under the Shaw

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* Under the heading of "Botanical Opportunity," in an address delivered before the Botanical Society of America, in August, 1896, and printed in Science of September 18, 1896, p. 367, and the Botanical Gazette of September 1896, p. 193, I have further analyzed this question of equipment and its utilization, as concerning institutions like the Garden.

foundation or on specific endowments which may in time come to the Garden for this purpose, and with this in view I would suggest, in case the Board secure permission to sell real estate, that it reserve that portion of the ground immediately north of the arboretum and fruticetum, ultimately improving it and utilizing it so as to make it an adequate source of revenue, but retaining the ownership, so that a zoological garden, if it were ever rendered possible, might easily be provided at that point as an adjunct to the Garden.

These plans, which I have gone into in some detail, are, nevertheless, in the main, outline plans, and it is impossible to say, until the exact financial prospects for any given period of years shall be known, how rapidly they can be materialized.

Concurring in my opinion that one of the most necessary early steps is the suitable extension of the grounds, the Board have intrusted to Messrs. Olmsted, Olmsted & Eliot, of Brookline, Massachusetts, the preparation of a general plan for the improvement of the pastures contiguous to the present garden, including details for the planting of the proposed North American synopsis, and accompanied by suggestions for the future treatment of the land now under cultivation, so as ultimately to secure a harmonious and logical whole. In the main, the suggestions of the report here quoted have been adopted by this firm, with the single important exception that for the proposed palm house the second site noted in my report has been chosen as the more appropriate. While these extension plans are yet too incomplete to admit of any very definite statement being made, it is hoped that the finances of the Board may render possible their early inception and uninterrupted, if gradual, accomplishment. The unfortunate storm losses of the past summer will also, no doubt, necessarily bring the renovation of the present flower garden into the near future.

As a first step toward the extension of the Garden as an institution of research, the Board, since the preceding outline of plans was submitted, have converted the horticultural appointment into one promising a sufficient increase in salary to make it possible for us to retain permanently a desirable appointee, and there is reason to hope that in

MASSED HERBACEOUS PLANTS.

their proper sequence the other steps which have been recommended may be taken.

Notwithstanding the limited force employed in the care of the library and herbarium and on research work, and the necessity of economy in all expenditures, the desirability of enabling employees of the Garden to enrich the herbarium by the results of their own collecting (which is recognized as one of the first principles of museum administration), and to make ecological studies where plants grow among their natural surroundings, has found practical recognition in the action of the Board in sending Professor Hitchcock on a winter cruise to the British West Indies in 1890–91,* in enabling me to spend some weeks in Colorado, in 1891,† and some months in California and the arid regions of the southwest in 1892,‡ in a study of the Yuccas and their pollination, and in two extended vacations which I have been permitted to spend in a study of the botany of the Azores and Madeira.§ Assistants, on several occasions, have been sent on shorter collecting excursions. The Garden has also found itself in a position to enable Mr. B. F. Bush, an active student of the flora of Missouri and the adjacent region, to visit many interesting points in Missouri, Arkansas, and the Indian Territory, a full set of his collections being donated to the herbarium, while the Garden has published several papers based on them.‖

THE SCHOOL OF BOTANY.

Mr. W. H. Rush and Mr. O. L. Simmons have continued, through the college year 1895–6 and 1896–7, to act as instructors respectively in general and cryptogamic botany. Undergraduate classes have been conducted in elementary morphology and organography (1),¶ elementary anatomy

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* Reports ii. 31; iii. 14, 17; iv. 47; viii. *infra*. † Report iii. 159.
‡ Report iv. 16, 181. § Reports vi. 17; viii. 51.
‖ Reports v. 15, 139; vi. 121.
¶ The numbers in parenthesis correspond with those used in the last

and phanerogamic botany (2), vegetable histology and its technique (5 and 6), applied mycology (11), vegetable physiology (14), and bacteriological technique (15). As in the preceding year, Miss A. I. Mulford has taught special classes at the Garden and elsewhere, especially adapting them to the needs of the teachers in the public schools of the city, in which a commendable effort is being made to introduce nature study as a part of the regular school work.

One candidate for the Doctor's degree has been engaged in resident work at the Garden during the present autumn.

Referring to a quinquennial report of progress published in the first Garden report,* and for subsequent details to the Director's report in each of the annual volumes,† it may be stated here that from a department controlling the time of one man and finding room in the University programme for only three short courses, the School of Botany has developed into an adequately manned department, offering a fairly complete and carefully selected series of courses open to students generally under the elective rules of the University.

In the arrangement of the electives now announced by the undergraduate department of Washington University, an effort has been made to include the smallest list of subjects which the School of Botany is prepared to teach, which, if followed, will lead to a reasonably good foundation knowledge of general botany, the expectation being that a student who has nearly or quite completed the series of electives may then devote not less than ten hours per week, through the entire Senior year, to some piece of special work,— such subjects, however, being so numerous and varied as not to require mention in a catalogue,

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catalogue of Washington University and the Sixth Garden Report, pp. 24–5, bacteriological technique having been added last year.

* First Report, 84.

† Garden Reports, i. 98; ii. 31; iii. 18; iv. 19; v. 19; vi. 23; vii. 23.

since no two students would be likely to select the same subject.

Although the small number of students enrolled in the undergraduate department prevents and is likely to prevent the School of Botany from giving instruction to any large number of undergraduate pupils, certain of the courses are taken by a relatively large number. Indeed, for those courses which students have thus far shown a disposition to elect, the laboratories and lecture room of the School of Botany are utilized to their fullest capacity. It is a matter of regret, from a botanical point of view, that few students elect the more technical of the courses which are offered, their purpose in most instances being merely the acquisition of such knowledge of botany as forms part of a general system of culture. As the number of undergraduate students in the University increases, however, it is hoped that more use will be made by them of the facilities afforded by the School of Botany and the closely affiliated Botanical Garden.

As was stated in the inaugural address on the opening of the School of Botany,* the furtherance of investigation is held to be no less proper to a department than the giving of direct instruction; and the policy of furnishing to instructors as well as pupils all procurable aids to the performance of such work, adopted from the start † and never deviated from, has rendered possible the completion of several pieces of work, the larger of which have been made the subjects of papers published either as "Contributions from the Shaw School of Botany" or otherwise. The principal of these publications are noted elsewhere in the present volume. That no papers have been issued from the School of Botany during the past few years is due in part to the publication of my own papers in the Reports of the Garden, which now claims the greater part of my time, and in part to the increased amount of teach-

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* First Report, 79.

† First Report, 100.

ing done at the School, since the adoption of an elective policy by the University has enabled undergraduates to make more use of the School of Botany.

Of the four assistants and instructors who have been connected with the School of Botany since its organization, besides the two who are still identified with its work, one was called to a college professorship of botany, one was engaged by the United States Department of Agriculture for the performance of physiological work, etc., in its subtropical laboratory, and the other two, after leaving the School of Botany, acted as botanical assistants at the Garden, from which they have been advanced to more responsible positions, — the plan at the University, as at the Garden, having been to consider these positions as transient, enabling incumbents to improve themselves during a limited connection with the School of Botany.

Very respectfully,

WILLIAM TRELEASE,
Director.

SCIENTIFIC PAPERS.

THE MOSSES OF THE AZORES.

BY J. CARDOT.

In 1870, in Godman's Natural History of the Azores, Mr. Mitten published a catalogue of the Muscineae observed in those islands as well as at Madeira and in the Canaries. That list contains, for the Azores, 44 mosses and 3 sphagna, gathered by Hunt, Watson and Godman. Since that time, at least to my knowledge, no new indication had been added to the stock of information we possessed about the bryological flora of this group of islands. Mr. William Trelease, Director of the Missouri Botanical Garden, having intrusted to me the study of mosses gathered in the Azores by himself and by Mr. C. S. Brown, Dr. Bruno Carreiro and Sr. C. Machado, in 1894 and 1896, I have found in these collections 52 species, of which 30 are not mentioned in Mr. Mitten's Catalogue; and among these 30, eight species and three varieties are entirely new. I have received also, through my excellent friend M. F. Renauld, some species, collected in 1895 and 1896, in the crater of Graciosa and on the peak of Pico, by MM. Blanchy, Richard and Minelle, during the last scientific cruises of H. H. the Prince of Monaco's yacht.

These several contributions raise to 80 the total number of species of mosses (not counting the Sphagna) thus far observed in the Azores. They are distributed in the

following manner amongst the different islands of the group:—

San Miguel, 49.	Pico, 8.
Sta. Maria, 36.	Terceira, 6.
Flores, 16.	Corvo, 3.
Fayal, 14.	San Jorge, 1.*
Graciosa, 9.	

The mere fact that several of the most important islands, like San Jorge, Terceira and Pico, do not, as yet, muster together more than 14 species, shows how much there is still to be done to arrive at a satisfactory knowledge of the bryological vegetation of this small cluster of islands, and I feel assured that careful investigation might easily double the number of species now known.

As could easily be concluded from the geographical situation of the islands, their bryological vegetation is in close relationship on the one hand with the vegetation of Madeira and the Canaries, and on the other with that of the Spanish peninsula and the shores of the Mediterranean. Out of the 80 species found in the Azores, about fifty are to be met with at Madeira and in the Canary islands, and sixty-one in Europe, especially in the Mediterranean region, and in Algeria. About forty are found also in North America.

A few species show some relationship between the bryological vegetation of the Azores and that of more distant regions. Thus, *Fissidens asplenioides* Hedw., widely distributed in the tropical parts of America, exists or is, at least, represented by very similar forms in the Azores, Madeira, the Canaries, Tristan d'Acunha, New Zealand and Tasmania. A small *Philonotis*, gathered by Mr. Trelease at Flores, is, to my mind, not different from *P. obtusata* C. Müll., from Madagascar. The genus *Sciaromium*, which counts three species at the Azores, has nearly all its

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* Eight species are mentioned in a general way, as occurring in the Azores, without any more particular indication.

other representatives in New Zealand and in the temperate regions of South America. *Hyophila Treleasei* Card. and *Lepidopilum fontanum* Mitt. represent at the Azores two genera almost exclusively tropical.

Among the mosses most worthy of notice, we shall mention in the first line some species and varieties quite endemic or which, at least, have not as yet been found elsewhere than at the Azores: *Campylopus flexuosus* var. *fayalensis* Card., *C. setaceus* Card., *Hyophila Treleasei* Card., *Trichostomum mucronatulum* Card. and *T. azoricum* Card., *Glyphomitrium azoricum* Card., *Bryum pachyloma* Card., *Breutelia azorica* (Mitt.), *Fontinalis antipyretica* var. *azorica* Card., and *Sciaromium Renauldi* Card. Then, another series of species which are found also at Madeira and in the Canaries, but nowhere else: *Ramphidium purpuratum* Mitt., *Campylopus azoricus* Mitt., *Bryum caespiticium* var. *atlanticum* Card., *Astrodontium canariense* Schw. and *A. Treleasei* Card., *Lepidopilum fontanum* Mitt., *Sciaromium prolixum* (Mitt.) and *S. spinosum* (Mitt.), and *Hylocomium Berthelotianum* (Mont.). These species may be called truly Atlantic. Finally, we shall note still, as interesting and also Atlantic species: *Glyphomitrium nigricans* Mitt., common enough at the Azores, Madeira and in the Canaries, but very rare in Europe, where it has been recorded only from a few Portuguese localities; and *Myurium hebridarum* Sch., and *Hypnum canariense* (Mitt.), both of which exist in the three clusters of islands, and of which the first is also found in the Hebrides and the second in Ireland.

CATALOGUE.

Gymnostomum Hedw.

1. G. **calcareum** Nees et Hornsch. Bryol. Germ. 1. p. 153.—San Miguel (Godman).—*Distrib.*: the five parts of the world.

Weisia Hedw.

2. W. viridula (Linn.) Hedw. Fund. ii. p. 90.— Azores (Godman). San Miguel (Trelease, Pl. Az. no. 1351).— *Distrib.:* throughout the world.

Ramphidium Mitt.

3. R. purpuratum Mitt. apud Godman, Nat. Hist. of the Azores, p. 291.— San Miguel (Godman).— *Distrib.:* Madeira.

Dicranum Hedw.

4. D. Scottianum Turn. Musc. Hib. p. 75, t. 6, f. 1.— Azores (Godman).— *Distrib.:* Europe.

This moss very likely does not belong to the true *D. Scottianum* Turn., but to *D. canariense* Hpe. in Bot. Zeit., 1862, p. 11.

Campylopus Brid.

5. **C. flexuosus** (Linn.) Brid. Mant. p. 71, var. **fayalensis** Card. *var. nova.*— Fayal (Brown, Pl. Az. no. 383).

A forma typica europaea differt foliis basi latioribus, acumine breviore cellulisque alaribus minus inflatis, auriculas vix efformantibus. Cespites densi, 6–8 centim. alti, superne lutescentes, intus rufo-tomentosi. Sterilis.— Pl. 1.— *a*, entire plant, nat. size; *b*, *b*, *b*, leaves × 14; *c*, basal areolation of a leaf × 130; *d*, marginal areolation in the middle of a leaf × 260; *e*, leaf point × 130; *f*, transverse section of a leaf × 130; *g*, portion of the same × 260.

6. **C. setaceus** Card. *sp. nova.*— Fayal (Brown, Pl. Az. no. 380 in part). San Miguel (Machado).

Lutescenti-viridis, sericeus, inferne fuscus, tomento destitutus. Caulis erectus vel ascendens, dichotome ramosus, apice attenuatus, 3–4 centim. longus. Folia remotiuscula, madida erecto-patentia, sicca erecto-flexuosa, 4–6 millim. longa, e basi lanceolata sensim et longissime subulata et subtubulosa, setacea, solo summo apice subhyalino denticulis paucissimis, cellulis alaribus magnis, inflatis, partim fuscis, partim hyalinis, auriculas distinctas efformantibus, sequentibus rectangulis, caeteris oblongis linearibusque, obtusis, incrassatis; costa circa tertiam partem basis vel ultra et totam fere subulam occupante, dorso laevi, in sectione transversali e cellularum stratis 3 composita, quorum interno e cellulis

laxis magnis, quadrangulis, inanibus, caeteris e cellulis parvis, incrassatis, stereidis intermixtis formatis. Caetera ignota.— Pl. 2.— *a*, entire plant, nat. size; *b*, *b*, *b*, leaves × 14; *c*, basal areolation of a leaf × 130; *d*, marginal areolation in the middle of a leaf × 260; *e*, *e*, leaf point × 130; *f*, portion of a transverse section of a leaf × 260.

Closely allied to *C. Boryanus* Besch. from Reunion Island, which has exactly the same structure of the costa; but *C. setaceus* has the stems and branches more slender and the leaves less crowded, with a much longer and thinner subula.

7. C. AZORICUS Mitt. apud Godman, Nat. Hist. of the Azores, p. 292.— San Miguel (Godman).— *Distrib.:* Madeira.

8. C. POLYTRICHOIDES De Not. Syll. Musc. p. 222 et Epil. p. 654. — San Jorge (Brown, Pl. Az. no. 378). San Miguel (Carreiro, Pl. Az. no. 16). Sta. Maria (Trelease, Pl. Az. nos. 1348, *b* and 1348, *c*). Graciosa (Blanchy). Pico (Richard and Minelle).— *Distrib.:* Europe, Algeria, Canaries, Madeira, and nearly all the tropical and subtropical zone if, according to Mr. Mitten's views, we consider this as a synonym of *C. introflexus* Brid.

The moss from San Miguel is a very peculiar form, with long, slender innovations, suddenly clavate at apex. Several female flowers are found in the terminal bunch of the comal leaves, which are rather abruptly constricted to the point and with rather well defined and often excavate auricles.

LEUCOBRYUM Hpe.

9. L. GLAUCUM (Linn.) Sch. Coroll. p. 19.— Pico, Fayal (Brown, Pl. Az. nos. 375 and 384). — *Distrib.:* Europe, North America, Canaries.

— var. ALBIDUM (Brid.) Card. (*Dicranum albidum* Brid. Musc. Recent. II. part 1, p. 167).— San Miguel, Sta. Maria (Trelease, Pl. Az. nos. 1348 and 1348, *a*).— *Distrib.:* Europe, North America.

The plant from Sta. Maria is a small form, with very narrow leaves, much resembling *L.molle* C. Müll., from Madagascar.

10. L. JUNIPEROIDEUM (Brid.) C. Müll. in Linnaea, XVIII. p. 689. (*Dicranum juniperoideum* Brid. Bryol. Univ.

1. p. 409).— Azores (Watson).— *Distrib.:* Canaries, Madeira.

This moss, of which I have been able, thanks to the generosity of M. F. Camus, to study an original specimen (Canaries, leg. Riedle, ex herb. Richard), seems to me not sufficiently distinct from the small forms of *L. glaucum*. The broadness of the hyaline border of the leaf, which is quoted by Bridel as distinctive for his *Dicranum juniperoideum*, proves to be variable in the Azorean specimens I have examined.

Fissidens Hedw.

11. F. serrulatus Brid. Mant. p. 190 et Bryol. Univ. II. p. 704.— Sta. Maria (Godman). San Miguel (Machado).— *Distrib.:* Canaries, Madeira, Algeria, South Europe, England.

12. F. asplenioides (Sw.) Hedw. Musc. Frond. III. p. 65, t. 28. (*F. flabellatus* Hornsch. Fl. Bras. fasc. I. p. 91, t. II. f. II?).— San Miguel (Godman). Sta. Maria (Trelease, Pl. Az. no. 1383, *c*).— *Distrib.:* Canaries, Madeira, tropical America, New Zealand, Tasmania, Tristan d'Acunha.

Mr. Mitten refers the Brazilian *F. flabellatus* Hornsch. to *F. asplenioides* Hedw., and quotes this last as pertaining to the Azores, Madeira and the Canaries. According to a recent communication of M. Bescherelle, Swartz's type of *Dicranum asplenioides* from Jamaica has the leaves narrowed, then broadly acuminate, and thereby differs from the South American specimens, which themselves are not identical with each other, but have generally more obtuse leaves than the type from Jamaica. The moss gathered by Mr. Trelease at Sta. Maria, in sterile state, has short stems, leaves in 10-12 pairs, obtuse, shorter and less obscurely areolate than in the South American specimens. I do not venture, however, to separate it from *F. asplenioides* Hedw., being at present unable to decide whether this species constitutes a polymorphous, widely distributed type, or whether there is, under this name, confusion of several distinct species.

Ceratodon Brid.

13. C. purpureus (Linn.) Brid. Bryol. Univ. I. p. 480.— Sta. Maria (Trelease, Pl. Az. no. 1383, *b* in part). Graciosa (Blanchy).— *Distrib.:* throughout the world.

Hyophila Hpe.

14. **H. Treleasei** Card. *sp. nova*.—Sta. Maria (Trelease, Pl. Az. no. 1383, *a*).

Dioica? Dense caespitosa vel pulvinata, inferne fuscescens, superne lutescens vel lurido-viridis. Caulis erectus, 5-7 millim. longus, simplex furcatusve. Folia conferta, madida erecto-patentia, sicca contorta, lineari-lanceolata, late acuminata, costa lutescente excurrente mucronata, marginibus planis integerrimis, cellulis minutissimis, obscuris, rotundatis, vel rotundato-quadratis, parietibus crassiusculis, sublaevibus, inferioribus laxis, teneris, oblongis, hyalinis. Folia perichaetialia erecta, e basi subvaginante anguste lineari-reticulata, sensim et longe acuminata, costa excurrente cuspidata, in quorum axillis paraphyses tenerrimae filiformes reperiuntur. Capsula in pedicello pallide lutescente, 5-7 millim. longo, oblonga, pallide badia, microstoma, gymnostoma, sicca plicatula, operculo longe oblique rostrato. Sporae minute verrucosae, 0 mm. .012 – 0 mm. .015.— Pl. 3. — *a*, entire plant, nat. size, in moist and dry state; *b*, *b*, *b*, leaves × 16; *c*, basal areolation of a leaf × 130; *d*, point of a leaf × 130; *e*, *e*, perichaetial leaves × 16; *f*, capsule in dry state × 16; *g*, the same in moist state × 16; *h*, spores × 260.

Quite distinct from *H. contorta* (Kze.) Jaeg., from Madeira, by the form of the leaves and the total lack of peristome.

Trichostomum Hedw.

15. T. MUTABILE Bruch mss.; De Not. Syll., p. 192.— San Miguel (Brown, Pl. Az. no. 388).— *Distrib.:* Europe, Algeria, Canaries, Madeira, South America, New Zealand.

16. T. FLAVOVIRENS Bruch in Flora, 1829, part II. p. 404, t. 2, f. 7.— San Miguel (Godman).— *Distrib.:* South and West Europe, Algeria, Florida.

17. **T. mucronatulum** Card. *sp. nova*.— San Miguel (Machado).

Humile, viride, 5–7 millim. altum. Caulis erectus, simplex. Folia irregulariter conferta, madida arcuato-patula, sicca incurvato-crispatula, oblongo-lingulata, apice plano obtuso vel subobtuso costa excurrente minute et breviter mucronato, marginibus planis subundulatis, supra basin plerumque minute denticulatis, deinde integerrimis; cellulis superioribus minutis, rotundatis, dense papillosis, unde valde obscuris, inferioribus pellucidis laevibus, elongate rectangulis, costam et margines versus majoribus, laxioribus. Caetera ignota.— Pl. 4.— *a*, entire plant,

nat. size, in moist and dry state; *b*, *b*, *b*, *b*, *b*, *b*, leaves × 30; *c*, basal areolation of a leaf × 260; *d*, point of the same × 260.

Resembling the small forms of *T. crispulum* Bruch, but quite distinct by the leaves not being cucullate at apex.—I have found only some sterile stems of this little moss amongst a tuft of *Hypnum cupressiforme*.

18. **T. azoricum** Card. *sp. nova*.— Terceira (Trelease, Pl. Az. no. 1383).

Monoicum vel subsynoicum, humile, pusillum. Caulis erectus, brevis (2-3 millim.), basi minute et remote, superne congeste foliosus. Folia inferiora brevia, appressa, superiora majora in rosulam congesta, madida patentia, sicca flexuosa, 2.50–3 millim. longa, lineali-lanceolata, acuta, apice saepe incurvo cucullata, marginibus plerumque inflexis, integerrimis, costa tereti percurrente vel infra summum apicem evanida; cellulae in parte superiore obscurae, parvae, rotundatae, minutissime papillosae, inferiores laxiores, rectangulae, pellucidae. Flos masculus sub femineo situs, vel antheridia in axillis foliorum perichaetialium nascentia, paraphysibus intermixtae. Folia perichaetialia caulinis paulo majora, costa latiore applanata instructa, superne subserrulata vel erosula. Capsula in pedicello pallide rubello, 8–15 millim. longo, erecta, oblonga, operculo conico recte rostrato, annulo duplici. Peristomii dentes pallide purpurei, elongati, ad basin usque bifidi, cruribus longis omnino liberis vel inferne hic illic cohaerentibus et interdum uno alterove ad basin fisso, dense papillosis, filiformibus, subnodulosis.—Pl. 5.—*a*, entire plant, nat. size; *b*, *b*, *b*, leaves × 30; *c*, basal areolation, near the costa × 260; *d*, basal areolation on the margin × 260; *e*, leaf point × 260; *f*, capsule × 14; *g*, two teeth of the peristome with portion of the annulus × 130.

Allied to the European *T. triumphans* De Not. and *T. pallidisetum* H. Müll., but distinguishable at first sight by its larger leaves and red pale pedicel.

Desmatodon Brid.

19. D. nervosus (Hook. et Tayl.) Br. Sch. Bryol. Eur. fasc. 18–20, Mon. p. 6, t. 3. (*Tortula atrovirens* (Sm.) Lindb. De Tort., p. 236).— Terceira (Trelease, Pl. Az. no. 1382).— *Distrib.:* Europe, Asia, Algeria, Cape, Chile, New Zealand, Tasmania.

Barbula Hedw.

20. B. marginata Br. Sch. Bryol. Eur. fasc. 13–15, Mon. p. 33, t. 19. (*Tortula acuminata* Mitt. apud Godman, Nat. Hist. of the Azores, p. 297).— San Miguel

(Hunt; Godman; Trelease, Pl. Az. nos. 1384, 1386 and 1387). Sta. Maria (Trelease, Pl. Az. no. 1387, *a*).—*Distrib.:* Europe, chiefly in the Mediterranean region, Asia, Algeria, Madeira, North America.

21. B. CONVOLUTA Hedw. Stirp. Crypt. I. p. 86, t. 32.—San Miguel (Trelease, Pl. Az. no. 1385).—*Distrib.:* Europe, Asia, Algeria, North America.

22. B. SQUARROSA Brid. Bryol. Univ. I. p. 833.—Sta. Maria (Trelease, Pl. Az. no. 1393, *d*).—*Distrib.:* Europe, Asia, Algeria, Canaries (?), North America.

23. B. LAEVIPILA (Brid.) Br. Sch. Bryol. Eur. fasc. 13–15, Mon. p. 40, t. 25.—San Miguel (Godman).—*Distrib.:* Europe, Algeria, Canaries, North America.

GRIMMIA Hedw.

24. G. PULVINATA (Linn.) Sm. Engl. Bot. t. 1728.—San Miguel (Godman).—*Distrib.:* the five parts of the world.

25. G. —— *sp. nova?* —Graciosa (Blanchy; Brown, Pl. Az. no. 380 in part). Sta. Maria (Trelease, Pl. Az. no. 1393, *c*).

This species seems to be allied to *G. trichophylla* Grev., but distinct. Unfortunately, all the specimens hitherto obtained are perfectly sterile.

RACOMITRIUM Brid.

26. R. FASCICULARE (Schrad.) Brid. Mant. p. 80.—Pico (Richard and Minelle).—*Distrib.:* Europe, North America.

27. R. HETEROSTICHUM (Hedw.) Brid. Mant. p. 79.—Pico (Richard and Minelle).—*Distrib.:* Europe, North America.

28. R. LANUGINOSUM (Ehrh.) Brid. Mant. p. 79.—San Miguel (Godman). Fayal (Brown, Pl. Az. no. 379,

and 380 in part). Pico (Richard and Minelle).— *Distrib.:* the five parts of the world.

GLYPHOMITRIUM Brid.

29. G. POLYPHYLLUM (Dicks.) Mitt., Lindb. Musci Scand. p. 29.— San Miguel (Godman).— *Distrib.:* Europe, Canaries, Madeira.

30. **G. azoricum** Card. *sp. nova.*— Corvo, Terceira, Flores, Sta. Maria (Trelease, Pl. Az. nos. 1373, 1374, 1375, 1376, 1377 and 1377, *a*).

Monoicum, pulvinatum, fulvescens aut luteo-viride. Caulis simplex vel e basi divisus, 5–15 millim. longus. Folia dense conferta, madida erecto-patentia, sicca cirrato-crispata, 3.25–4 millim. longa, e basi anguste oblonga plicata, longe lineali-lanceolata, acuta subacutave, carinata, marginibus planis vel reflexis apicem versus remote sinuoso-dentatis aut integris, costa tereti percurrente, cellulis inferioribus laxis, subrectangulis, fuscescentibus, suprabasalibus flavidis, linearibus, mediis quadratis vel oblongis, superioribus subrotundato-quadratis, omnibus incrassatis laevibus. Folia perichaetialia vix diversa. Pedicelli nunc solitarii, nunc geminati, pallidi, siccitate infra capsulam haud vel vix dextrorsum torti, 3–5 millim. longi. Capsula oblonga, leptoderma, laevis, pallida, ore rubro, operculo conico recte vel oblique aciculari-rostrato. Peristomii dentes pallide rubelli, apice saepe decolorati, basin versus usque in crura duo subulata filiformia papillosa soluti. Flores masculi sub femineo siti.— Pl. 6.— *a*, entire plant, in moist state, nat. size; *b*, the same, in dry state, nat. size; *c*, *c*, leaves × 14; *d*, *d*, leaf point × 30; *e*, basal areolation of a leaf × 130; *f*, areolation in the middle of a leaf, near the costa × 260; *g*, marginal areolation of a leaf, in the upper part × 260; *h*, leaf point × 130; *i*, *i*, capsules and perichaetial leaves × 14; *j*, capsule × 14; *k*, two teeth of the peristome × 130.

May be considered as a subspecies of *G. polyphyllum* Mitt., from which it differs in the smaller sizes, the shorter and less aggregated pedicels, the smaller capsules and the narrower, entire or less denticulate leaves.

31. G. NIGRICANS (Br. Sch.) Mitt. apud Godman, Nat. Hist. of the Azores, p. 294.— San Miguel (Godman). Graciosa (Trelease, Pl. Az. no. 1393).— *Distrib.:* Canaries, Madeira, Portugal.

— var. PULVINARE (Mitt.) Card. (*G. pulvinare* Mitt. in

Journ. Linn. Soc. 1863, p. 2).— Sta. Maria (Trelease, nos. 1393, *a* and 1393, *b*).— *Distrib.:* Madeira.

I cannot consider *G. pulvinare* Mitt. as specifically distinct from *G. nigricans;* the longer pedicel and the generally less obscure areolation of the leaves, composed of rather larger and more distinct cells, are characters of insufficient value to allow a specific distinction for this form.

PHYSCOMITRIUM Brid.

32. P. PYRIFORME (Linn.) Brid. Bryol. Univ. II. p. 815.— Sta. Maria (Godman). — *Distrib.:* Europe, Algeria, Canaries, North America, New Zealand.

ENTOSTHODON Schw.

33. E. TEMPLETONI (Sm.) Schw. Suppl. II. II. fasc. 1, p. 44, t. CXIII.— Sta. Maria (Godman). Fayal (Watson). San Miguel (Machado). — *Distrib.:* Europe, Algeria, Egypt, Sinaï, Canaries, Madeira, California.

FUNARIA Schreb.

34. F. HYGROMETRICA (Linn.) Sibth. Fl. Oxon. p. 288.— San Miguel (Godman). — *Distrib.:* throughout the world.

BRYUM Dill.

35. B. ARGENTEUM Linn. Sp. Plant. p. 1120.— San Miguel (Godman). Sta. Maria (Trelease, no. 1380, *e*).— *Distrib.:* the five parts of the world.

36. B. ALPINUM Huds. Fl. Angl. p. 415, var. MERIDIONALE Sch. Syn. Musc. Eur. ed. 2, p. 441.— Sta. Maria (Trelease, Pl. Az. no. 1380, *d*).— *Distrib.:* Madeira, Portugal, England.

This variety belongs to the group of the southern forms of *B. alpinum* including *B. mediterraneum* and *gemmiparum* De Not. From these it differs by its leaves being narrower, more acuminate and shortly mucronate by the excurrent costa; from *B. alpinum*, type, it is distinct in the smaller sizes, the leaves narrower, not tinged with red below, plane or

scarcely revolute on the borders and more narrowly areolate.— The *B. alpinum* var. *angustifolium* Husnot, Muscol. Gall., p. 247 (*B. atlanticum* Solms), seems to be the same plant.

B. Notarisii Mitt. (*Mielichoferia crassinervia* Jur.) much resembles *B. alpinum* var. *meridionale* Sch. as to the vegetative system; but its peristome is far less evolute, the teeth of the exostome being narrower, less trabeculate and the endostome entirely wanting.

37. **B. caespiticium** Linn. Sp. Plant. p. 1121, var. **atlanticum** Card. *var. nova*.— Sta. Maria (Trelease, Pl. Az. nos. 1380, *a*, 1380, *b*, 1380, *c*). — *Distrib.:* Madeira.

A forma typica differt foliis costa excurrente brevius cuspidatis, in comam densam glomeratis capsulaque minus abrupte pendula, subhorizontalis vel inclinata, pro more angustiore.

A striking form.

38. B. CAPILLARE Linn. Sp. Plant. p. 1121.— San Miguel (Godman). Flores (Trelease, Pl. Az. nos. 1378 and 1380).— *Distrib.:* the five parts of the world.

39. B. CANARIENSE Brid. Mant. p. 118, et Bryol. Univ. I. p. 672. — Graciosa (Brown, Pl. Az. no. 380, in part).— *Distrib.:* Canaries, Portugal, Corsica, France.

40. **B. pachyloma** Card. *sp. nova*.—Terceira (Trelease, Pl. Az. no. 1381). San Miguel (Machado).

Caulis brevis, sub perichaetio innovans, 5–7 millim. altus. Folia in comam congesta, obovato-oblonga vel subspathulata, madida erecto-patentia, sicca erecto-imbricata, vix flexuosa, circa 2 millim. longa, brevissime acuminata, toto ambitu limbo crassissimo 3–4-stratoso, superne remote et plerumque obsolete denticulato circumducta, costa viridi basi rubescente valida, apice cum limbo confluente in cuspidem crassam obsolete denticulatam breviter excedente; cellulis ovato- et oblongo-hexagonis, inferioribus elongatis subrectangulis laxioribus, infimis, inanibus rubescentibus. Folia perichaetialia externa lineari-oblonga, laxius reticulata, intima minora, lanceolata, longius acuminata, limbo angustiore. Capsula in pedicello rubente flexuoso 12–15 millim. longo, inclinata vel subhorizontalis, oblongo-subcylindrica, basi attenuata, operculo convexo apiculato. Annulus? Peristomium *B. capillaris*. Dioicum videtur.— Pl. 7.— *a*, entire plant, nat. size; *b*, *b*, *b*, leaves × 14; *c*, leaf point × 130; *d*, transverse section of a leaf in the lower part × 60; *e*, transverse section of the border of the leaf × 260; *f*, capsule × 14.

This species is very peculiar by the strongly thickened margin of

the leaves, which constitutes two true marginal nerves, showing the same structure and, in the upper part of the leaf, the same broadness and thickness as the median costa. In *B. platyloma* Schw. from Madeira, of which I have been able to study the original specimen, preserved in the herbarium Hedwig-Schwaegrichen at the Musée Boissier, the leaves also show a very broad margin, composed of linear, yellowish, thickened cells, but disposed in a single layer, a character which alone would be sufficient to separate the two species; besides, in *B. pachyloma* Card., the costa is much stouter and forms a much shorter and thicker point than in *B. platyloma* Schw.— The margin of *B. Donianum* Grev., although thickened, cannot be compared with that of *B. pachyloma*, which is, at least, thrice stouter.

In his contributions to the Cryptogamic Flora of the Atlantic Islands (Journ. Linn. Soc., 1863, p. 4), Mr. Mitten too briefly describes a *B. obovatum* Mitt. from Madeira, which seems to approach *B. pachyloma* by the thickness of the terete margin, but according to the description, the leaves of Mr. Mitten's species are twice as wide as those of *B. Donianum*, and almost uniformly reticulate, the lower cells being neither elongated nor rectangular,— features which do not agree with *B. pachyloma*, which has the leaves rather smaller than those of *B. Donianum* and with a distinct basal areolation of elongated, subrectangular cells, much larger and looser than the upper ones.

Anomobryum Sch.

41. A. julaceum (Sm.) Sch. Syn. Musc. Eur. ed. 1, p. 382.— San Miguel (Godman).— *Distrib.:* Europe, Algeria, Cameroon, Canaries, Madeira, Central and South America.

Webera Hedw.

42. W. Tozeri (Grev.) Sch. Coroll. p. 67.— San Miguel (Godman).— *Distrib.:* Europe, Algeria, Canaries, Madeira, North America.

Mnium Dill.

43. M. undulatum (Linn.) Weis. Pl. Crypt. Fl. Gott. p. 158.— Flores (Godman). San Miguel (Trelease, Pl. Az. no. 1349).— *Distrib.:* Europe, Algeria, Madeira, Canaries.

Philonotis Brid.

44. P. rigida Brid. Bryol. Univ. II. p. 17.— San Miguel (Hunt; Watson; Machado; Trelease, Pl. Az. no.

1347). Sta. Maria (Trelease, Pl. Az. no. 1347, *a*). Fayal (Godman).— *Distrib.:* South Europe, Algeria, Canaries, Madeira.

45. P. FONTANA (Linn.) Brid. Bryol. Univ. II. p. 18.— San Miguel (Brown, Pl. Az. no. 393).— *Distrib.:* the five parts of the world.

46. P. OBTUSATA C. Müll. apud Ren. et Card. Musci Exot. novi vel min. cogn., fasc. VII. p. 169 (Bull. de la Soc. royale de Bot. de Belg. t. xxxiv. part 2, p. 61).— Flores (Trelease, Pl. Az. no. 1350).— *Distrib.:* Madagascar.

Tenella, 1–2 centim. alta. Caulis simplex vel parce divisus. Folia parva, vix 1 millim. longa, erecto-patentia, saepe curvatula, oblongo-lanceolata, late et breviter acuminata, inferiora obtusa, superiora obtusiuscula, subacuta acutave, marginibus planis in parte superiore obtuse serratis, costa valida infra apicem evanida, dorso denticulata, rete laxo pellucido laevi. Caetera desunt.— Pl. 8.— *a*, entire plant, nat. size; *b*, *b*, *b*, *b*, leaves × 30; *c*, basal areolation of a leaf × 130; *d*, marginal areolation, in the middle of a leaf × 130; *e*, *e*, *e*, upper areolation × 130.

Although it is very astonishing to find in the Azores a species hitherto known only from Madagascar, it seems impossible not to refer the moss from Flores to *P. obtusata* C. Müll.; it differs only in the green glaucous tint, not dirty reddish, and the less distant leaves; but as to the shape and areolation of the leaves, it agrees exactly with the moss from Madagascar.

BREUTELIA Sch.

47. B. AZORICA (Mitt.) Card. (*Bartramia azorica* Mitt. apud Godman, Nat. Hist. of the Azores, p. 300).— San Miguel (Hunt, ex Watson; Machado; Trelease, Pl. Az. no. 1368). Fayal (Godman).

ATRICHUM Pal. Beauv.

48. A. UNDULATUM (Linn.) Pal. Beauv. Prodr. p. 42.— Flores (Godman). San Miguel (Machado).— *Distrib.:* Europe, Asia, Algeria, Madeira, North America.

Pogonatum Pal. Beauv.

49. P. aloides (Hedw.) Pal. Beauv. Prodr. p. 84.— Flores (Trelease, Pl. Az. no. 1364). San Miguel (Machado; Trelease. Pl. Az. no. 1365; Carreiro, no. 18).— *Distrib.;* Europe, Algeria, Canaries, Madeira.

Polytrichum Dill.

50. P. commune Linn. Sp. Plant. ii. p. 1109.— Azores (Godman). San Miguel (Machado; Brown, Pl. Az. no. 387; Trelease, Pl. Az. nos. 1357, 1358, 1359, 1360, 1361; Carreiro, no. 19). Terceira (Trelease, Pl. Az. no. 1363). Fayal (Brown, Pl. Az. nos. 381 and 382). Corvo (Prince of Monaco).— *Distrib.:* Europe, Asia, America, Canaries, Madeira.

— var. minus Weis. Pl. Crypt. Fl. Gott. p. 171.— Flores (Trelease, Pl. Az. no. 1353).— *Distrib.:* Europe, Madeira.

— var. perigoniale (Mich.) Br. Sch. Bryol. Eur. fasc. 21–22, Mon. p. 13, t. 17, f. *β*.—San Miguel, Sta. Maria (Trelease, Pl. Az. no. 1353, *a*; Carreiro, no. 19, *a*).— *Distrib.*: Europe, North America.

— var.? —Corvo (Trelease, Pl. Az. no. 1356).

51. P. formosum Hedw. Sp. Musc. p. 92, t. 19, fig. 1 et *a*.— Flores (Trelease, Pl. Az. nos. 1354 and 1362).— *Distrib.:* Europe, Asia, Algeria, Madeira, North America.

— forma breviseta.— San Miguel (Trelease, Pl. Az. no. 1355).

52. P. juniperinum Willd. Fl. Berol. Prodr. p. 305.— Graciosa (Blanchy).— *Distrib.:* the five parts of the world.

53. P. piliferum Schreb. Spic. Fl. Lips. p. 74.—Graciosa (Blanchy).— *Distrib.:* the five parts of the world.

Fontinalis Dill.

54. F. **antipyretica** Linn. Sp. Plant. p. 1571.— Flores (Godman).—*Distrib.:* Europe, Asia, Algeria, Madeira, North America.

— var. **azorica** Card. *var. nova.*— Flores (Trelease, Pl. Az. no. 1367).

A forma typica differt foliis dorso haud curvatis, minus acute carinatis, nonnullis tantum plicatis, cellulis parietibus angustissimis, alaribus numerosioribus, auriculas distinctiores efformantibus. Sterilis. Habitu formis robustioribus *F. Duriaei* Sch. sat similis.

Astrodontium Schw.

55. A. **canariense** Schw. Suppl. II. I. 2, p. 128, t. CXXXIV.—San Miguel (Godman).— *Distrib.:* Canaries, Madeira.

56. **A. Treleasei,** Card. *sp. nova.* — Terceira, Sta. Maria (Trelease, Pl. Az. nos. 1352 and 1352, *a*). Graciosa (Brown, Pl. Az. no. 386).— *Distrib.:* I have received from M. F. Renauld, a sterile and rather stunted specimen, collected in Madeira by R. Fritze in 1880 and labeled by M. Geheeb *A. canariense*, but which seems to belong to *A. Treleasei* Card.

Verisimiliter dioicum, caespitosum, sordide vel lutescenti-viride. Caulis repens, stoloniformis, ramis numerosis fasciculatis, crassis, erectis vel ascendentibus, simplicibus, siccitate rigidulis, teretibus, 1–2 centim. longis. Folia 2–2.50 millim. longa, dense conferta, madida patentia, sicca arctissime imbricata, ovato-lanceolata, acuminata, acuta, valde plicata, enervia, marginibus late reflexis ubique integerrimis, cellulis omnibus incrassatis, mediis linearibus, flexuosis, margines versus oblongis ovatisve, alaribus permultis, obscurioribus, interdum fuscescentibus recte seriatis, subrotundatis, marginalibus transverse dilatatis. Folia perichaetialia externa abrupte cuspidata, intima longe convoluta, acuminata, integerrima. Capsula in pedicello rubello, 8–10 millim. longo, superne dextrorsum torto, erecta inclinatave, ovato-subglobosa, badia, operculo ignoto. Peristomii externi dentes albidi, spongiosi, fragiles, intus trabeculati, papillosi, integri, linea divisurali superne valde conspicua, siccitate reflexi; interni membrana annulari albida, 16-plicata. Planta mascula ignota.— Pl. 9.— *a*, entire plant, nat. size; *b*, *b*, *b*, leaves × 14; *c*, basal areolation of a leaf × 260; *d*, marginal areolation

in the middle of a leaf × 260; *e*, leaf point × 260; *f*, perichaetium × 14; *g*, capsule × 14; *h*, portion of the mouth of the capsule × 60; *i*, a tooth of the exostome with a portion of the membrane of the endostome × 260.

Easily known from *A. canariense* Schw. by the much smaller sizes, the shorter and more shortly acuminate leaves, and the more numerous, less thickened and colored alar cells, extending higher along the margins of the leaf. As far as concerns the vegetative system, *A. Treleasei* very much resembles *Leucodon sciuroides* Schw., but it is readily distinguished from that species by the shape of the perichaetial leaves and especially by the structure of the peristome, which agrees exactly with that of *A. canariense*.

Pterogonium Sw.

57. P. gracile (Dill.) Sw. Musc. Suec. p. 26.— Graciosa (Blanchy).— *Distrib.:* Europe, Algeria, Canaries, Madeira, California.

Lepidopilum Brid.

58. L. (Tetrastichium) fontanum Mitt. in Journ. Linn. Soc. 1863, p. 4.— Flores (Godman).— *Distrib.:* Madeira.

Thuidium Br. Sch.

59. T. tamariscinum (Hedw.) Br. Sch. Bryol. Eur. fasc. 49–51, Mon. p. 7, t. 2 et 3.— San Miguel (Godman; Machado; Brown, Pl. Az. no. 395).— *Distrib.:* Europe, Madeira.

Brachythecium Br. Sch.

60. B. salebrosum (Hoffm.) Br. Sch. Bryol. Eur. fasc. 52–54, Mon. p. 16, t. 15 et 16.— San Miguel (Brown, Pl. Az. no. 396). Sta. Maria (Trelease, Pl. Az. no. 1369, *c*, in part).— *Distrib.:* Europe, Asia, Algeria, Canaries, North America.

Myurium Sch.

61. M. hebridarum Sch. Syn. Musc. Eur. ed. 2, p. 808.— Azores (Hunt). Flores (Trelease, Pl. Az. nos. 1370, 1371 and 1372). Fayal (Brown, Pl. Az. no. 397 in

part). Sta. Maria (Trelease, Pl. Az. nos. 1372, *a* and 1372, *b*). San Miguel (Machado).— *Distrib.:* Madeira, Canaries, Hebrides.

Scleropodium Br. Sch.

62. S. illecebrum (Schw.) Br. Sch. Bryol. Eur. fasc. 45–46, Mon. p. 3, t. 2.— Azores (Godman).— *Distrib.:* Europe, Algeria, Canaries, Madeira, North America.

Eurhynchium Br. Sch.

63. E. circinatum (Brid.) Br. Sch. Bryol. Eur. fasc. 57–61, Mon. p. 5, t. 3.— Flores (Trelease, Pl. Az. no. 1390).— *Distrib.:* South and West Europe, Algeria.

64. E. meridionale (Sch.) DeNot. in Piccon. Elenco Muschi Ligur. no. 32. (*E. longirostre* var. *meridionale* Br. Sch. Bryol. Eur. fasc. 57–61, Mon. p. 7, t. 5, fig. B. *Hypnum striatum* var. *Duriaeanum* Mont. apud Dur. Pl. Astur. no. 139).— Azores (Godman).— *Distrib.:* South Europe, Algeria, Madeira.

65. E. praelongum (Linn., Hedw.) Br. Sch. Bryol. Eur. fasc. 57–61, Mon. p. 8, t. 6.— Pico (Brown, Pl. Az. no. 385). San Miguel, Sta. Maria (Trelease, Pl. Az. nos. 1369 and 1369, *a*).— *Distrib.:* Europe, Asia, Algeria, North and South America.

— var. atrovirens (Sw.) Br. Sch. Bryol. Eur. fasc. 57–61, Mon. p. 8, t. 7, fig. 1, 1b, 2 et 3. (*Hypnum atrovirens* Sw. Disp. p. 65, non Dicks. *H. Swartzii* Turn. Muscol. Hib. p. 151, t. 14, f. 1).— Sta. Maria (Godman; Trelease, Pl. Az. no. 1369, *b*).— *Distrib.:* Europe, Asia, Algeria, Madeira.

66. E. Stokesii (Turn.) Br. Sch. Bryol. Eur. fasc. 57–61, Mon. p. 10, t. 8.— Sta. Maria (Godman; Trelease, Pl. Az. no. 1346, *b*).— *Distrib.:* Europe, Algeria, Madeira, Canaries, North America.

Rhynchostegium Br. Sch.

67. R. confertum (Dicks.) Br. Sch. Bryol. Eur. fasc. 49–51, Mon. p. 7, t. 4.— Sta. Maria (Godman).— *Distrib.:* Europe, Algeria, Canaries, Madeira.

68. R. rusciforme (Neck.) Br. Sch. Bryol. Eur. fasc. 49–51, Mon. p. 11, t. 9.— San Miguel, Flores (Trelease, Pl. Az. nos. 1345, 1395, and 1395,*a*).—*Distrib.:* Europe, Asia, Algeria, Canaries, North America.—

— forma.— San Miguel (Trelease, Pl. Az. no. 1346, *a*.)

Thamnium Br. Sch.

69. T. alopecurum (Linn.) Br. Sch. Bryol. Eur. fasc. 49–51, Mon. p. 4, t. 1.— San Miguel (Machado; Brown, Pl. Az. nos. 389 and 390; Trelease, Pl. Az. no. 1346; Carreiro, no. 17).— *Distrib.:* Europe, Asia, Algeria, Madeira, Canaries.

Plagiothecium Br. Sch.

70. P. sylvaticum (Linn.) Br. Sch. Bryol. Eur. fasc. 48, Mon. p. 14, t. 11.— San Miguel (Machado).— *Distrib.:* Europe, Asia, Algeria, North America.

Sciaromium Mitt.

71. S. prolixum (Mitt.) Jaeg. et Sauerb. Adumbr. Fl. Musc. (*Leskea*, *Sciaromium*, *prolixa* Mitt. in Journ. Linn. Soc. 1863, p. 7).— Fayal (Godman).— *Distrib.:* Madeira.

72. S. (Echinodium) spinosum (Mitt.) Card. (*Leskea*, *Sciaromium*, *spinosa* Mitt. l. c.).—Azores (Hunt).— *Distrib.:* Madeira.

73. **S. (Echinodium) Renauldi** Card. *sp. nova*.— Pico (Brown, Pl. Az. no. 377).

Habitu et magnitudine *S. setigero* (Mitt.) simile. Folia firma, rigida, 3.25–4.25 millim. longa, plerumque subhomomalla, e basi lanceolata

integerrima haud vel vix plicata sensim attenuata, margine incrassato, nervo valido compresso in subulam crassam laevem longe excedente, cellulis pachydermicis fere ubique (praeter basin versus et juxta costam) bistratosis, margines versus 3-4-stratosis, inferioribus breviter linearibus, infimis lutescentibus, alaribus paucis brevibus, superioribus minutis, rotundatis ovatisve. Caetera ignota.— Pl. 10.— *a*, entire plant, nat. size; *b*, *b*, *b*, leaves × 14; *c*, basal areolation of a leaf × 260; *d*, areolation in the middle of the lamina × 260; *e*, areolation in the upper part of the lamina × 260; *f*, point of the subula of a leaf × 260; *g*, transverse section of a leaf, in the lower part × 60; *h*, portion of the same × 130.

Differs from *S. setigerum* (Mitt.), from Madeira, by the leaves gradually narrowed and quite entire on the margins. It is more closely allied with *S. hispidum* (Hook. et Wils.), a South Pacific species, with the leaves strongly plicate and the lower cells shorter.

I name this fine moss in honor of my excellent friend M. F. Renauld.

Hypnum Dill.

74. H. cupressiforme Linn. Sp. Plant. p. 1592.— Fayal (Godman). San Miguel (Machado; Brown, Pl. Az. nos. 392 and 394). Corvo (Trelease, Pl. Az. no. 1389). Graciosa (Blanchy).— *Distrib.:* the five parts of the world.

— var. resupinatum (Wils.) Sch. Syn. Musc. Eur. ed. 2, p. 757. (*H. resupinatum* Wils. Bryol. Brit. p. 398).— Fayal (Brown, Pl. Az. no. 399). Flores (Trelease, Pl. Az. no. 1388). Graciosa (Blanchy).— *Distrib.:* Europe.

75. H. canariense (Mitt.) Jaeg. et Sauerb. Adumbr. Fl. Musc. ii. p. 584. (*Stereodon canariensis* Mitt. in Journ. Linn. Soc. 1863, p. 5).— San Miguel (Godman; Brown, Pl. Az. no. 391). Pico, Fayal (Brown, Pl. Az. nos. 376 and 398).— *Distrib.:* Canaries, Madeira, Ireland.

— forma gracilis filiformis.— Flores (Trelease, Pl. Az. no. 1392).

76. H. purum Linn. Sp. Plant, p. 1594.— Sta. Maria (Godman; Trelease, Pl. Az. no. 1394, *a*). Flores

(Trelease, Pl. Az. no. 1392).— *Distrib.:* Europe, Algeria, Madeira, Miquelon Island.

77. H. CUSPIDATUM Linn. Sp. Plant. p. 1595.— Sta. Maria (Godman). San Miguel (Machado; Brown, Pl. Az. no. 393 in part).— *Distrib.:* Europe, Asia, Algeria, North America, New Zealand.

HYLOCOMIUM Br. Sch.

78. H. SQUARROSUM (Linn.) Br. Sch. Bryol. Eur. v. Mon. p. 9, t. 6.— Fayal (Godman).— *Distrib.:* Europe, Asia, North America.

79. H. SPLENDENS (Hedw.) Br. Sch. Bryol. Eur. v. Mon. p. 5, t. 1.— San Miguel (Trelease, Pl. Az. no. 1391).— *Distrib.:* Europe, Asia, Algeria, Canaries, North America.

80. H. BERTHELOTIANUM (Mont.) Geheeb, in Flora, 1886, no. 22. (*Hypnum Berthelotianum* Mont. Hist. des Iles Canaries, p. 4, t. 1, f. 2).— San Miguel (Hunt; Godman; Machado). Fayal (Brown, Pl. Az. no. 397). Sta. Maria (Trelease, Pl. Az. no. 1391, *a*).— *Distrib.:* Canaries, Madeira.

SPHAGNUM (Dill.) Ehrh.

(ACCORDING TO DR. C. WARNSTORF.)

1. S. CYMBIFOLIUM Hedw. Fund. Musc. II. p. 86 ex parte.— Fayal (Godman). San Miguel (Machado).— *Distrib.:* Europe, Asia, North America.

— VAR. GLAUCESCENS Warnst. in Bot. Gazette, XV. p. 251 (ut var. *laeve* f. *glaucescens*).— Terceira (Trelease, Pl. Az. no. 1333).

— VAR. PALLESCENS Warnst. Eur. Torfm. no. 9 (ut var. *laeve* f. *pallescens*).— Flores (Trelease, Pl. Az. no. 1332).

— var. FUSCESCENS Warnst. Die Europ. Torfm. p. 135 (ut *S. cymbifolium* var. 1 *vulgare* ζ *fuscescens*).—Terceira, San Miguel (Leg....? Comm. Daveau; herb. Cardot).

— var. COMPACTUM Schlieph. et Warnst. apud Warnst. in Flora, 1884.— Terceira (Leg....? Comm. Daveau; herb. Cardot).

2. S. CENTRALE Arn. et Jens. in Bihang til K. Svenska Vet. Akad. Handl. Band xxi. Afd. III. no. 10. (*S. intermedium* Russ. Zur Kenntniss etc. p. 108, non Hoffm.).— Corvo, San Miguel (Trelease, Pl. Az. nos. 1331 and 1335).— *Distrib.:* Europe, Caucasus, North America.

3. S. RIGIDUM Sch. Hist. Nat. des Sph. p. 72, pl. XVIII.— San Miguel (Godman).— *Distrib.:* Europe, Siberia, Madeira, North America.

4. S. SQUARROSUM Pers. apud Schrad. Journ. Bot. 1800, p. 398.— Azores (Teste Warnstorf, in Hedwigia, 1890, p. 181).— *Distrib.;* Europe, Siberia, North America.

5. S. ACUTIFOLIUM (Ehrh.) Russ. et Warnst. in Bot. Ver. Prov. Brandenb. XXX. p. 112.— Fayal (Godman). Terceira (Trelease, Pl. Az. no. 1336).— *Distrib.;* Europe, Asia, North and South America.

6. S. SUBNITENS Russ. et Warnst. in Bot. Ver. Prov. Brandenb. XXX. p. 115.— Flores, San Miguel (Trelease, Pl. Az. nos. 1341 and 1344; Machado).— *Distrib.:* Europe, Asia, North America.

7. S. GODMANII Warnst. in Hedwigia, 1890, p. 189, pl. IV. f. 1a, 1b, pl. VII. f. 19.— Azores (Godman; herb. Mitten).

This is perhaps Mr. Mitten's *S. acutifolium* from Fayal, in Godman's Nat. Hist. of the Azores, p. 316.

8. **S. nitidulum** Warnst. in litt. ad Card. 1896; *sp. nova.*— Terceira, in thermal sulphurous springs (Leg....? Comm. Daveau; herb. Cardot.

ON SOME MOSSES COLLECTED IN MADEIRA BY WILLIAM TRELEASE, IN JUNE, 1896.

BY J. CARDOT.

1. WEISIA VIRIDULA (Linn.) Hedw. Fund. II. p. 90.— The Mount (Trelease, no. 3000).

2. DICRANUM CANARIENSE Hpe. in Bot. Zeit. 1862, p. 11.— Caldeirâo do Inferno (Trelease, no. 3001).

This moss has been mistaken for *D. Scottianum* Turn., from which it differs chiefly by the distinctly serrate leaves. The true *D. Scottianum* seems not to be found either at Madeira, or in the Canaries. (Cf. Geheeb, Bryologische Fragmente, in Flora, 1886, no. 22).

3. TRICHOSTOMUM CIRRHIFOLIUM (Mitt.) Card. (*Tortula cirrhifolia* Mitt. apud Godman, Nat. Hist. of the Azores, p. 296).— Boa Ventura (Trelease, no. 3002). Ribeira da Vigaria (Trelease, no. 3114 in part).

4. AMPHORIDIUM CURVIPES (C. Müll.) Jaeg. Adumbr. Fl. Musc. p. 386. (*Zygodon curvipes* C. Müll. Syn. I. p. 681).— Ribeiro Frio (Trelease, no. 3003).

5. HEDWIGIA CILIATA (Dicks.) Ehrh. Hannov. Mag. 1781, p. 109.— Torrinhas (Trelease, no. 3004).

6. GLYPHOMITRIUM POLYPHYLLUM (Dicks.) Mitt., Lindb. Musci Scand., p. 29. (*Ptychomitrium procerum* Sch.).— Ribeiro Frio, Caldeirâo do Inferno (Trelease, nos. 3005, 3006).

Ptychomitrium procerum Sch. is, to my mind, a mere robust form of *G. polyphyllum*.

7. GLYPHOMITRIUM NIGRICANS (Br. Sch.) Mitt. var. PULVINARE (Mitt.) Card. (*G. pulvinare* Mitt. in Journ. Linn. Soc. 1863, p. 2).— Ribeiro Frio (Trelease, no. 3007).

8. PHILONOTIS RIGIDA Brid. Bryol. Univ. II. p. 17.— Sta. Cruz, Caldeirâo do Inferno, Mount (Trelease, nos. 3008, 3009, 3010).

9. PHILONOTIS MARCHICA (Willd.) Brid. Bryol. Univ. II. p. 23, forma.— Ribeira da Vigaria (Trelease, no. 3011).

10. BRYUM PLATYLOMA Schw. Suppl. I. II. p. 116, t. LXXVI. — Caldeirâo do Inferno, Ribeira da Vigaria, Mount (Trelease, nos. 3012, 3013, 3014).

11. **Bryum serrulatum** Card. *sp. nova*.— Funchal (Trelease, no. 3015).

Dioicum, nitidum, lutescens. Caulis brevissimus, simplex vel sub perichaetio innovans, vix 3–4 millim. altus. Folia in comam densam congesta, madida rosulatim patentia, sicca appressa, superiora oblongo-lanceolata, breviter acuminata, costa excurrente mucronata, 1.50–2 millim. longa, inferiora minora, angustiora, longius acuminata, omnia marginibus e basi usque ad apicem versus anguste revolutis, superne minute sed distincte serrulata, costa basi dilatata, breviter excurrente; cellulis oblongo-hexagonis, inferioribus rectangulis. Folia perichaetialia externa comalibus subsimilia sed integra vel subintegra, intima multo minora, longius acuminata, marginibus planis integris. Capsula in pedicello rubello, circa 15 millim. longo, inclinata vel subhorizontalis, obovato-oblonga, basi attenuata, fusca, operculo convexo apiculato. Planta mascula ignota. — Pl. 11. — *a*, entire plant, nat. size; *b*, *b*, *b*, *b*, *b*, leaves × 14; *c*, basal areolation of a leaf × 130; *d*, leaf point × 130; *e*, capsule × 14.

Allied to *B. canariense* Brid., but easily known from that species by the very short stems, the more abruptly constricted and shorter acuminate leaves, glomerate to an apical bunch, the thinner costa and the suberect or inclined capsule.

12. BRYUM CAESPITICIUM Linn. var. ATLANTICUM Card. in Rept. Mo. Bot. Gard. VIII. p. 62. Sâo Jorge (Trelease, no. 3016).

13. **Mnium** — *sp. nova?* Ribeiro Frio (Trelease, no. 3017).

Very likely a new species, but unfortunately in a single fragment.

14. POGONATUM ALOIDES (Hedw.) Pal. Beauv. Prodr. p. 84.— Mount (Trelease, no. 3018).

15. Polytrichum commune Linn. var. minus Weis. Pl. Crypt. Fl. Gott. p. 171. — Caldeirâo do Inferno (Trelease, no. 3019).

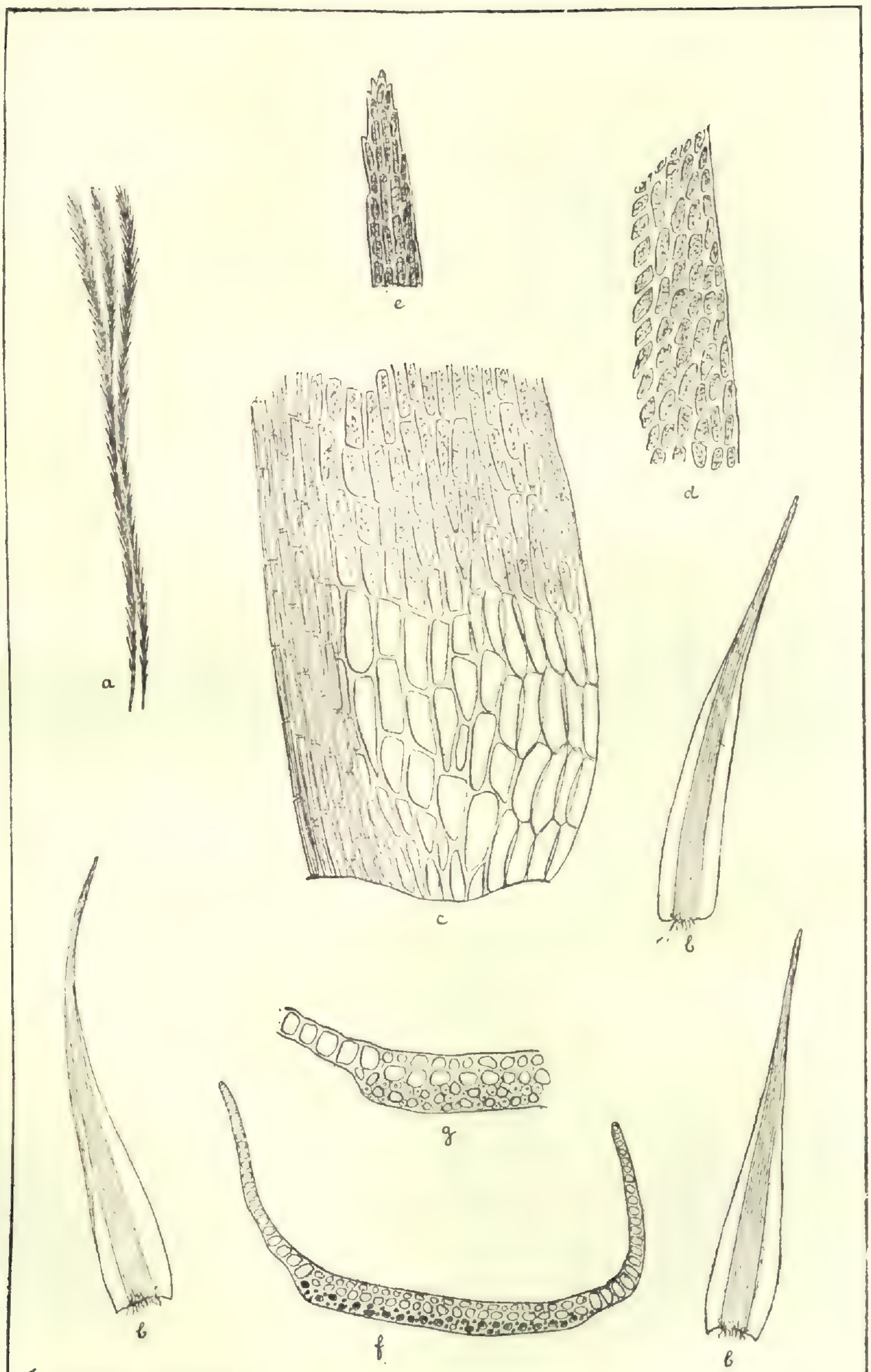
16. Polytrichum piliferum Schreb. Spic. Flor. Lips. p. 74.— Ribeiro Frio (Trelease, no. 3020).

17. Thamnium alopecurum (Linn.) Br. Sch. Bryol. Eur. fasc. 49–51, Mon. p. 4, t. 1.— Ribeiro Frio (Trelease, no. 3021.)

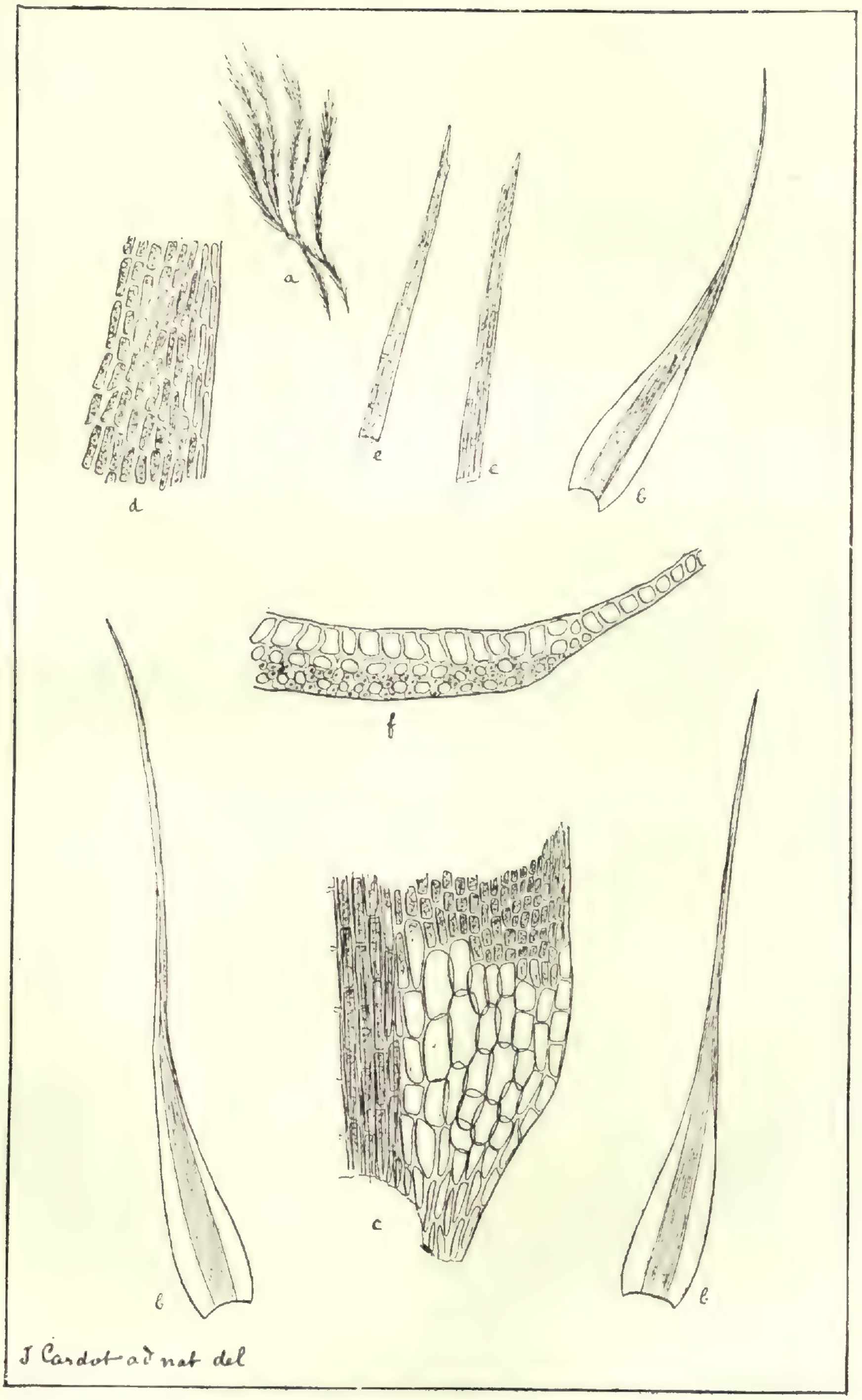
18. Sciaromium prolixum (Mitt.) Jaeg. et Sauerb. Adumbr. Fl. Musc.—Torrinhas, Ribeiro Frio, Ribeira Brava (Trelease, nos. 3022, 3023).

19. Hypnum purum Linn. Sp. Plant. p. 1594.— Boa Ventura, Caldeirâo do Inferno (Trelease, nos. 3024, 3025).

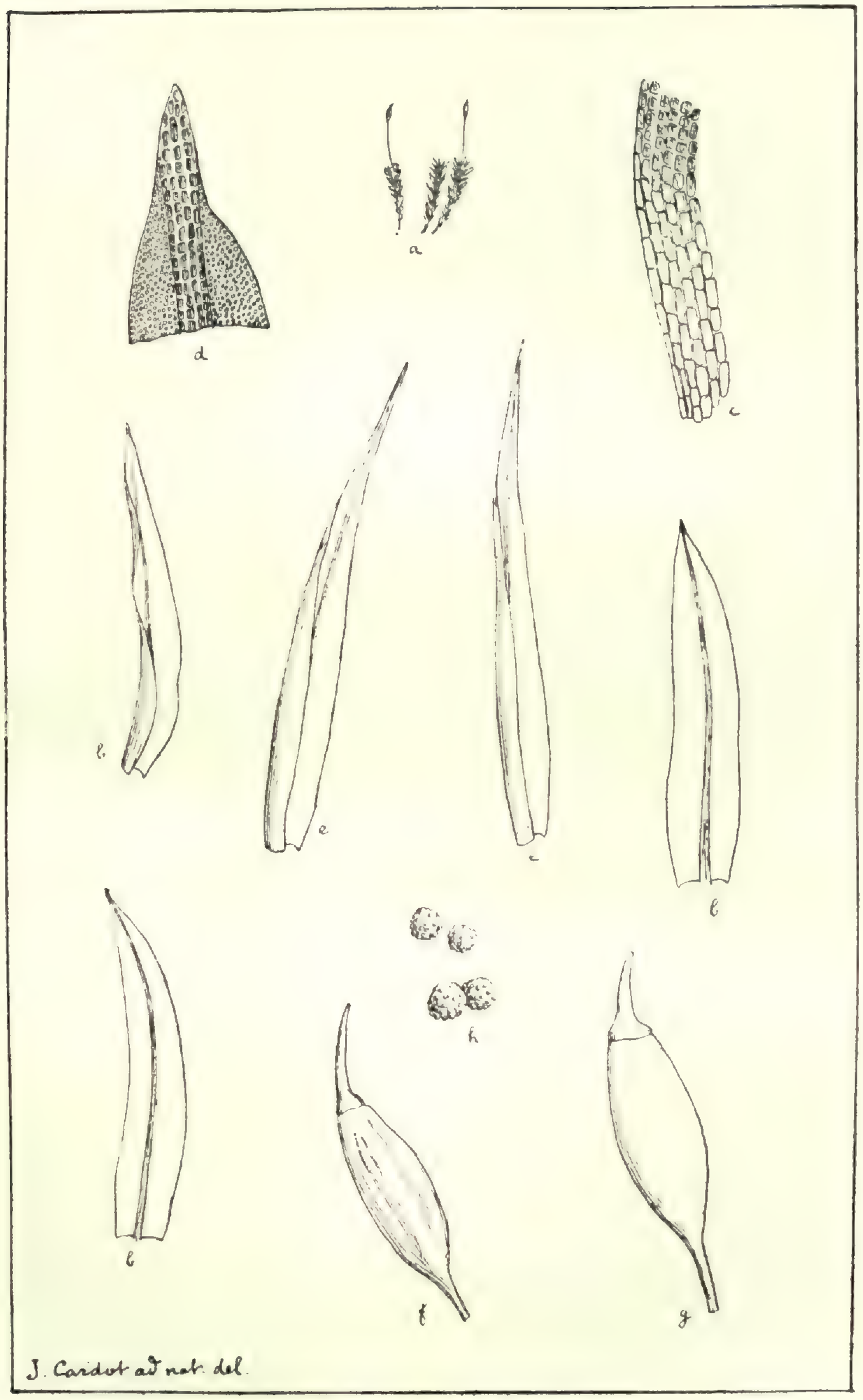
Stenay, Feb. 1897.



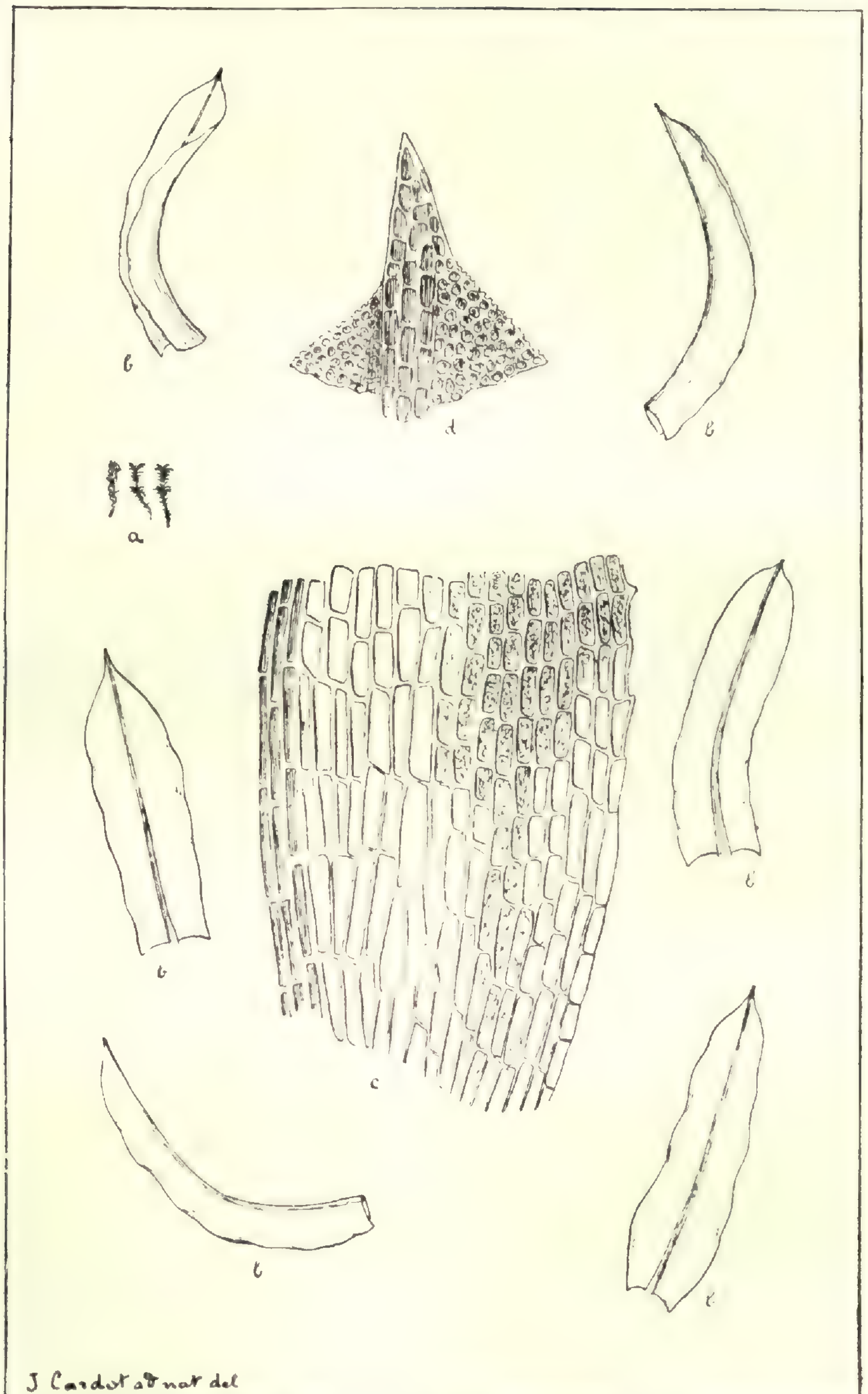
CAMPYLOPUS FLEXUOSUS, VAR. FAYALENSIS.



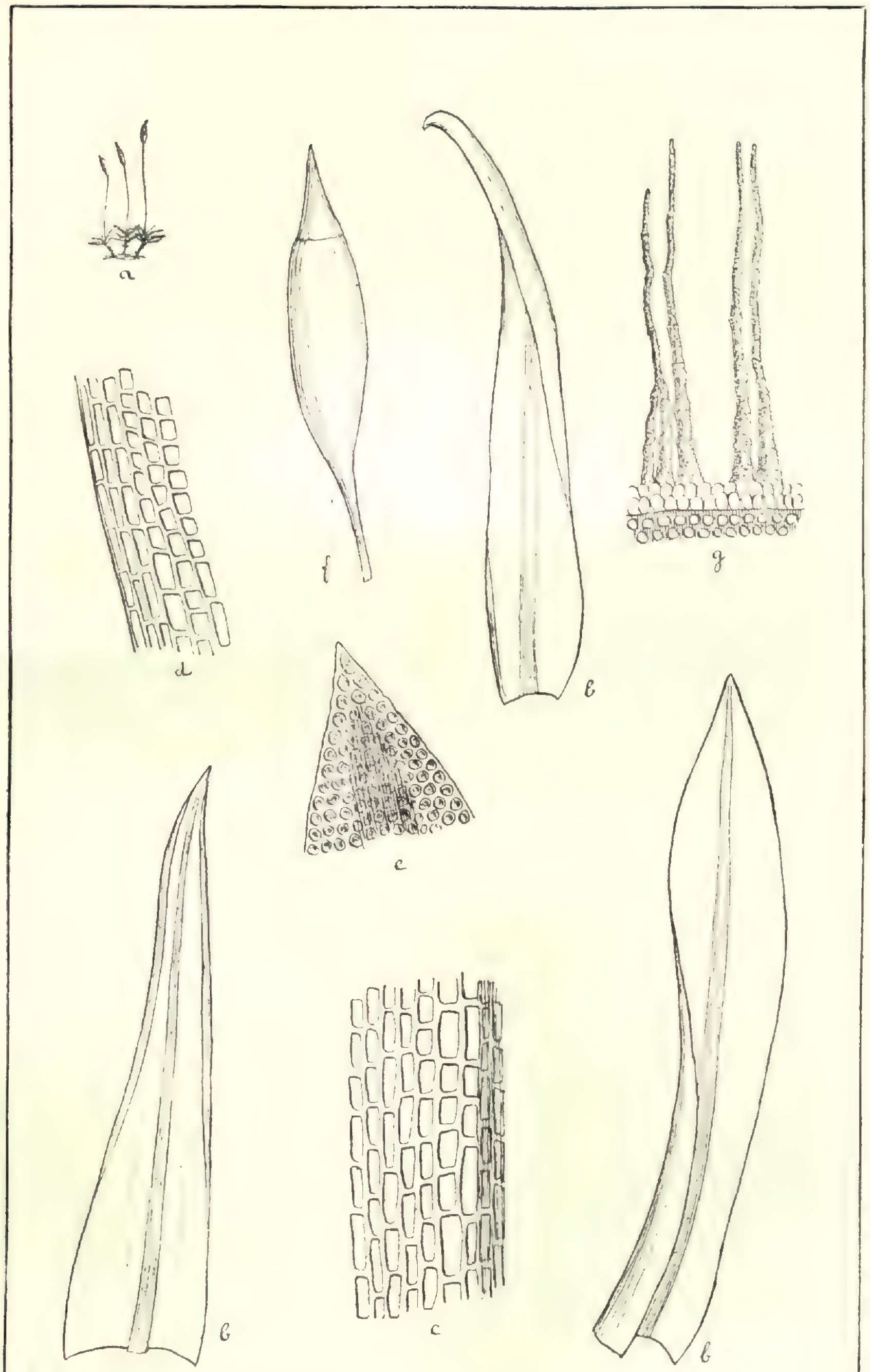
CAMPYLOPUS SETACEUS.



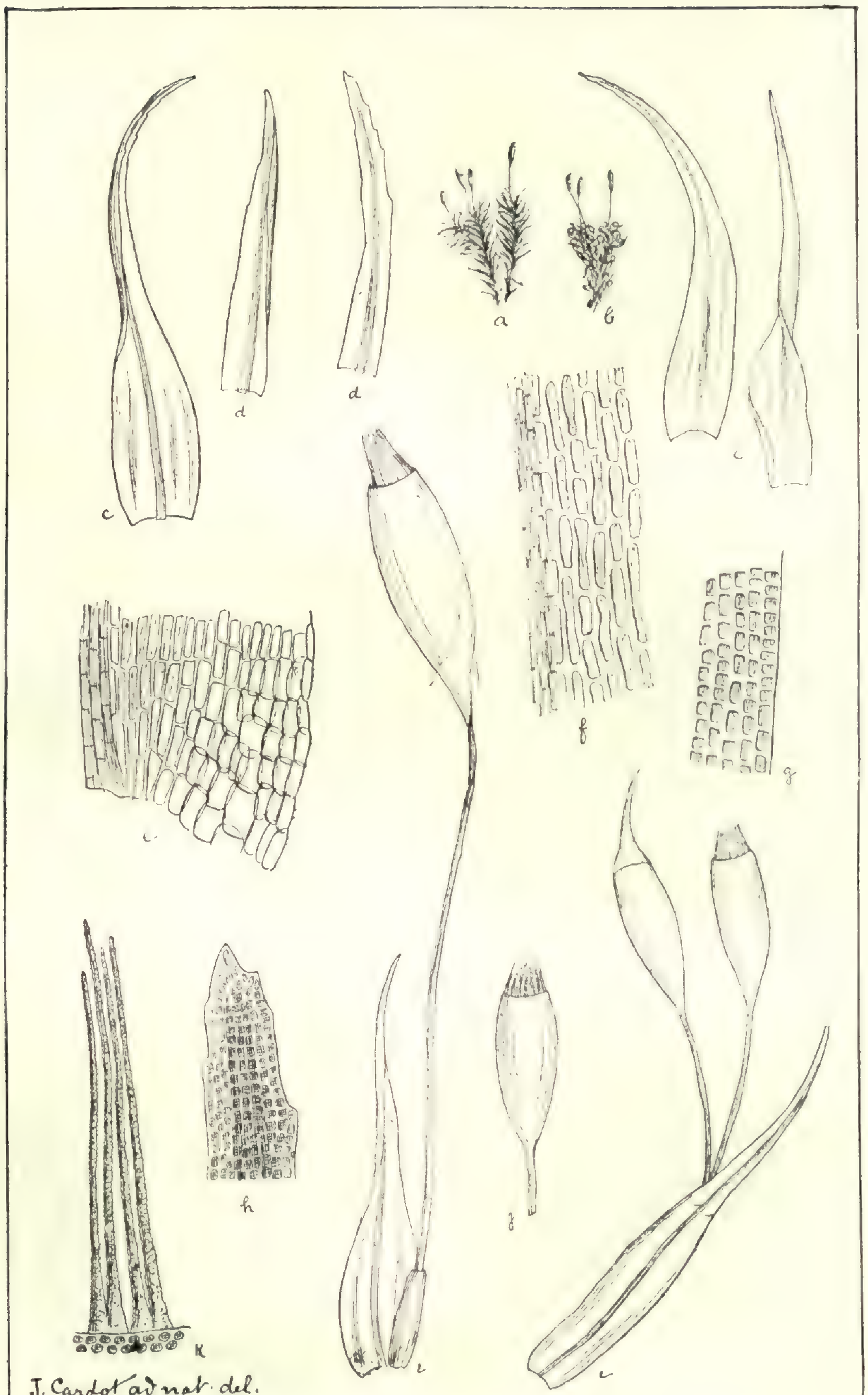
HYOPHILA TRELEASEI.



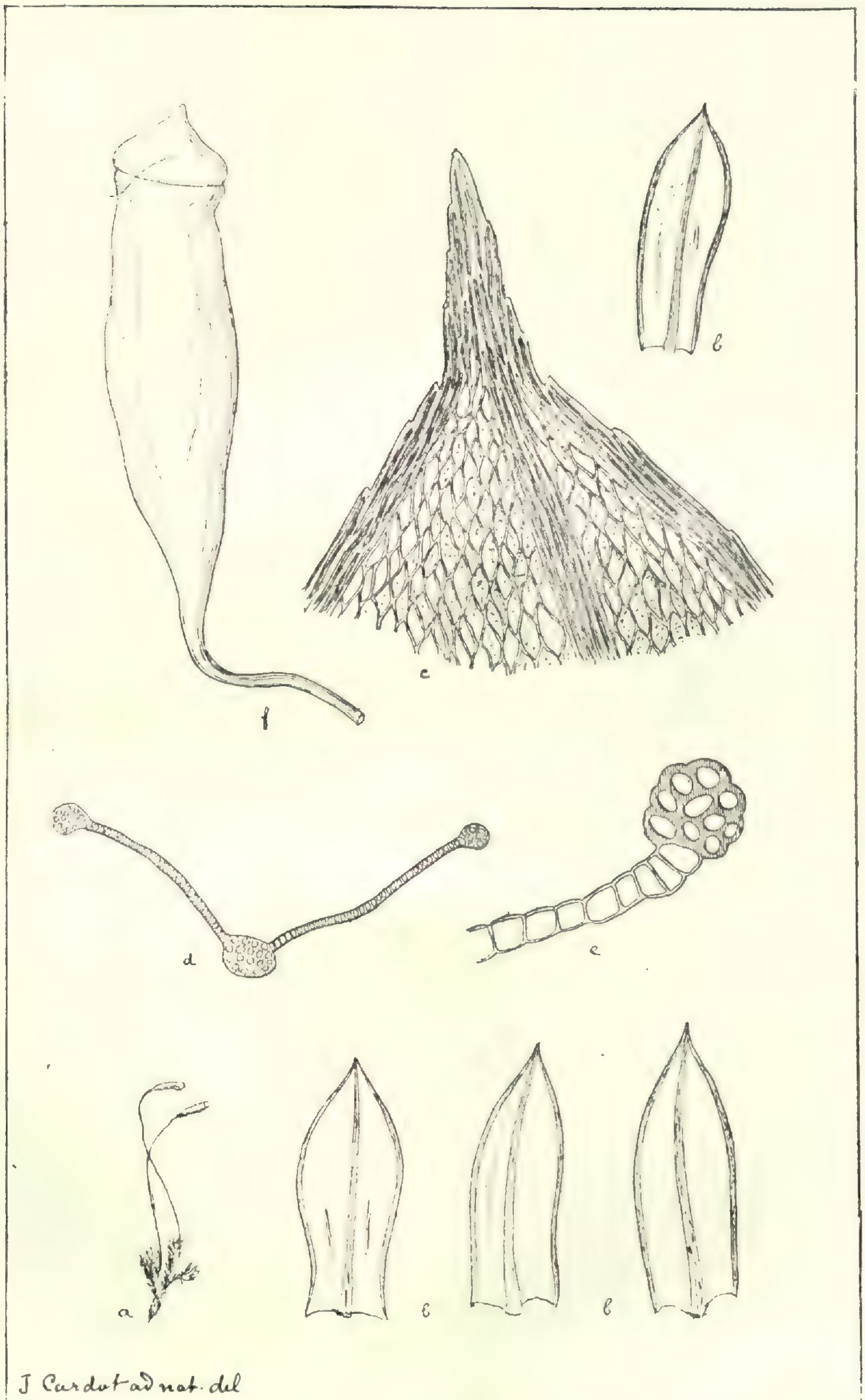
TRICHOSTOMUM MUCRONATULUM.



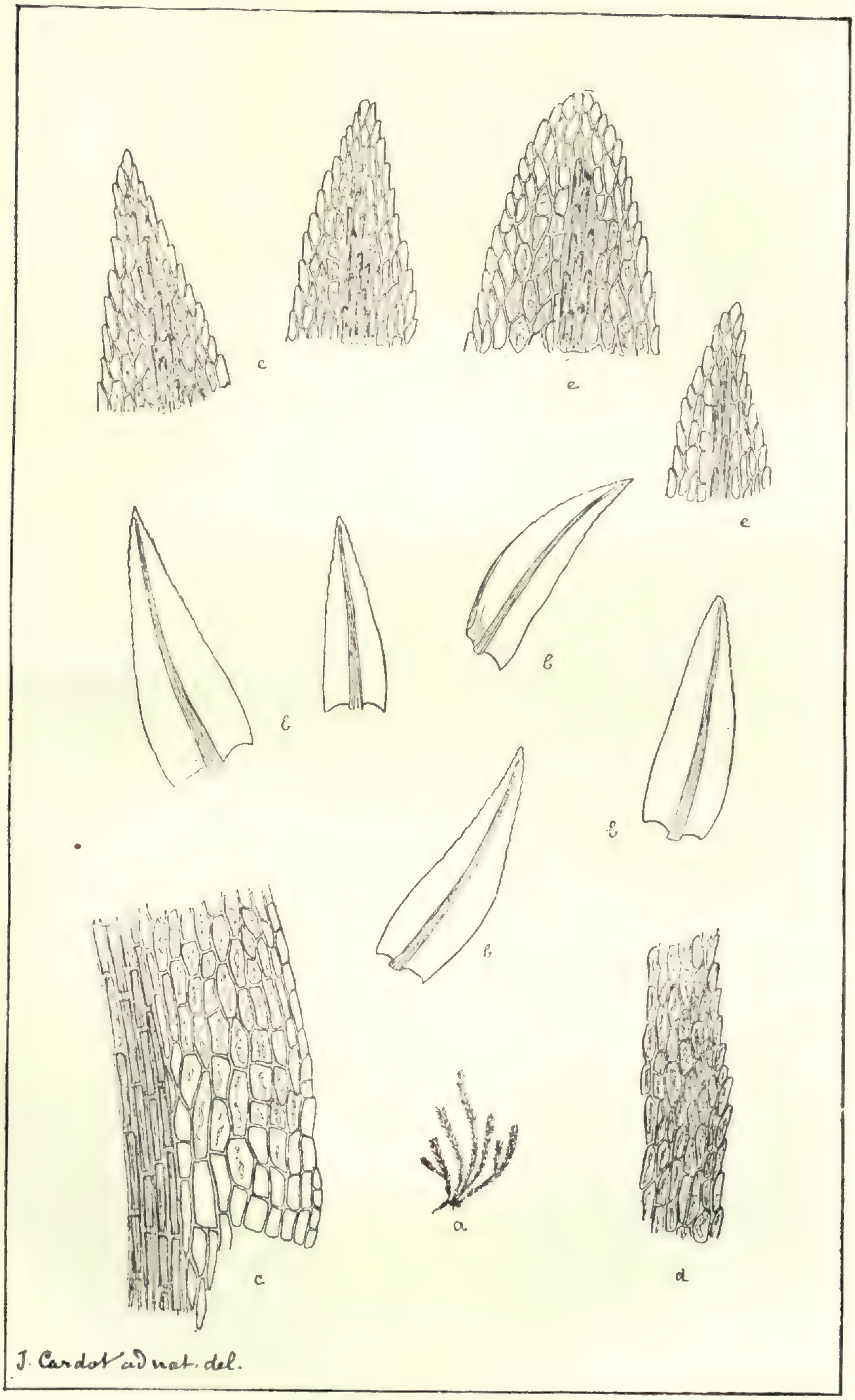
TRICHOSTOMUM AZORICUM.



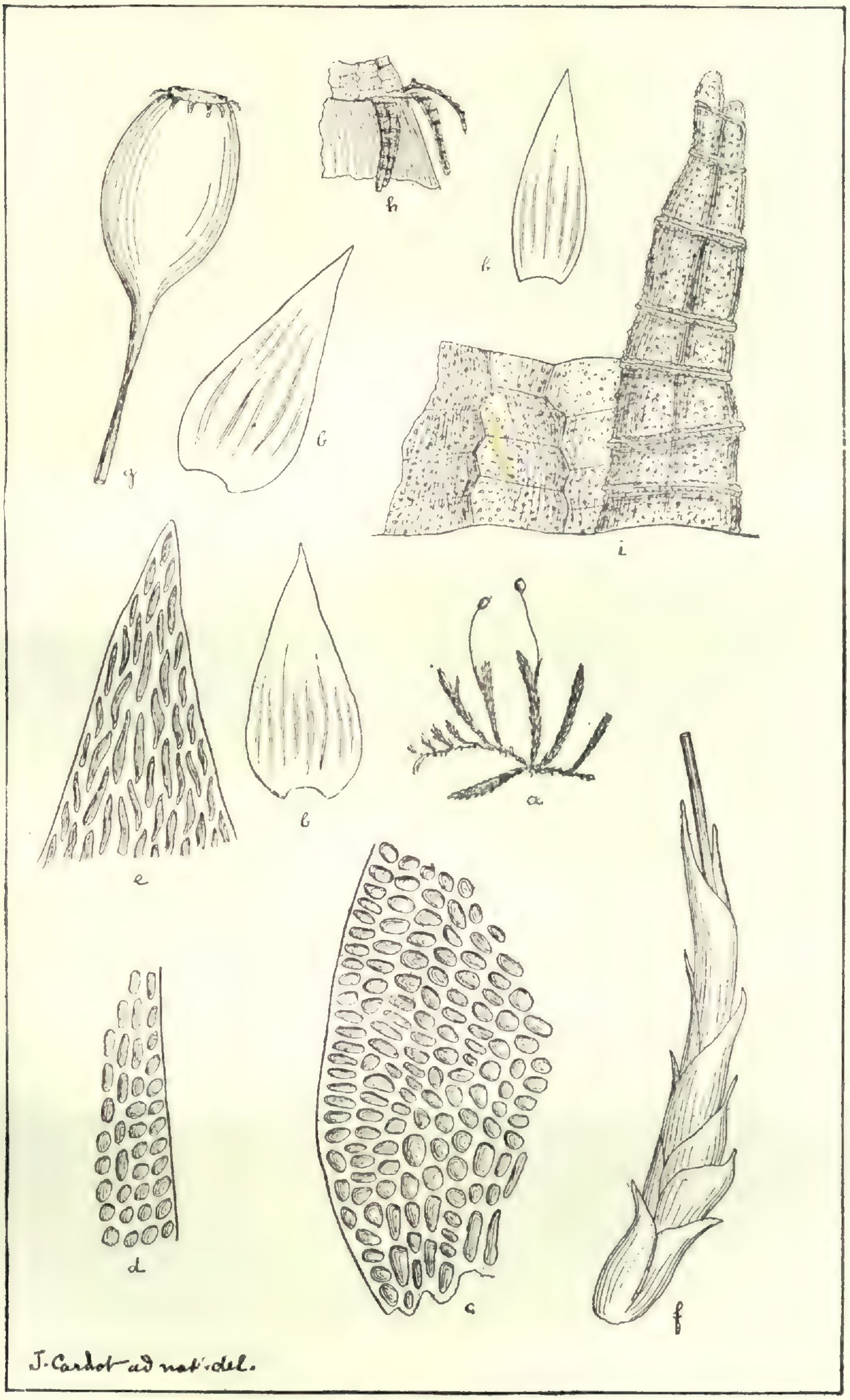
GLYPHOMITRIUM AZORICUM.



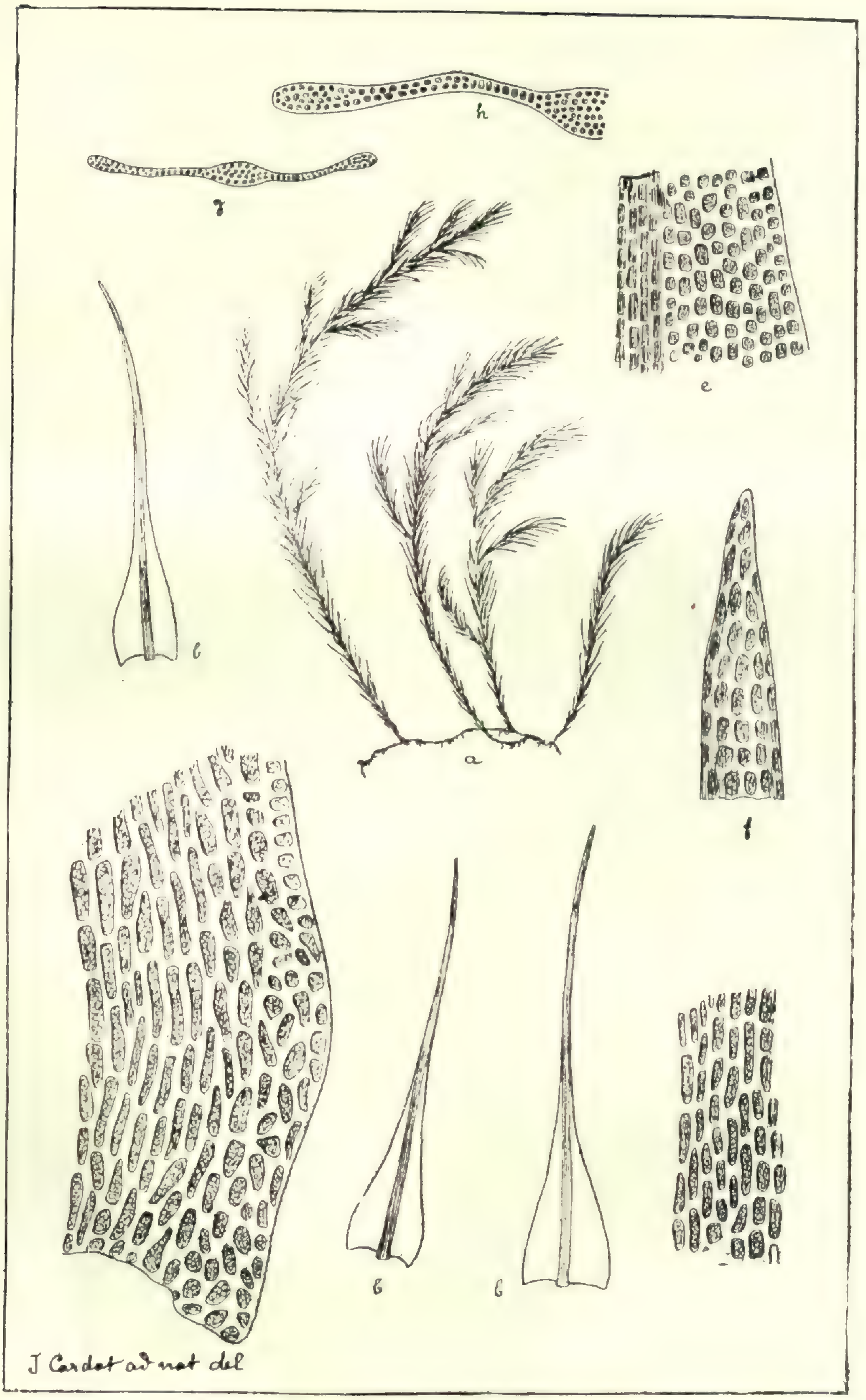
BRYUM PACHYLOMA.



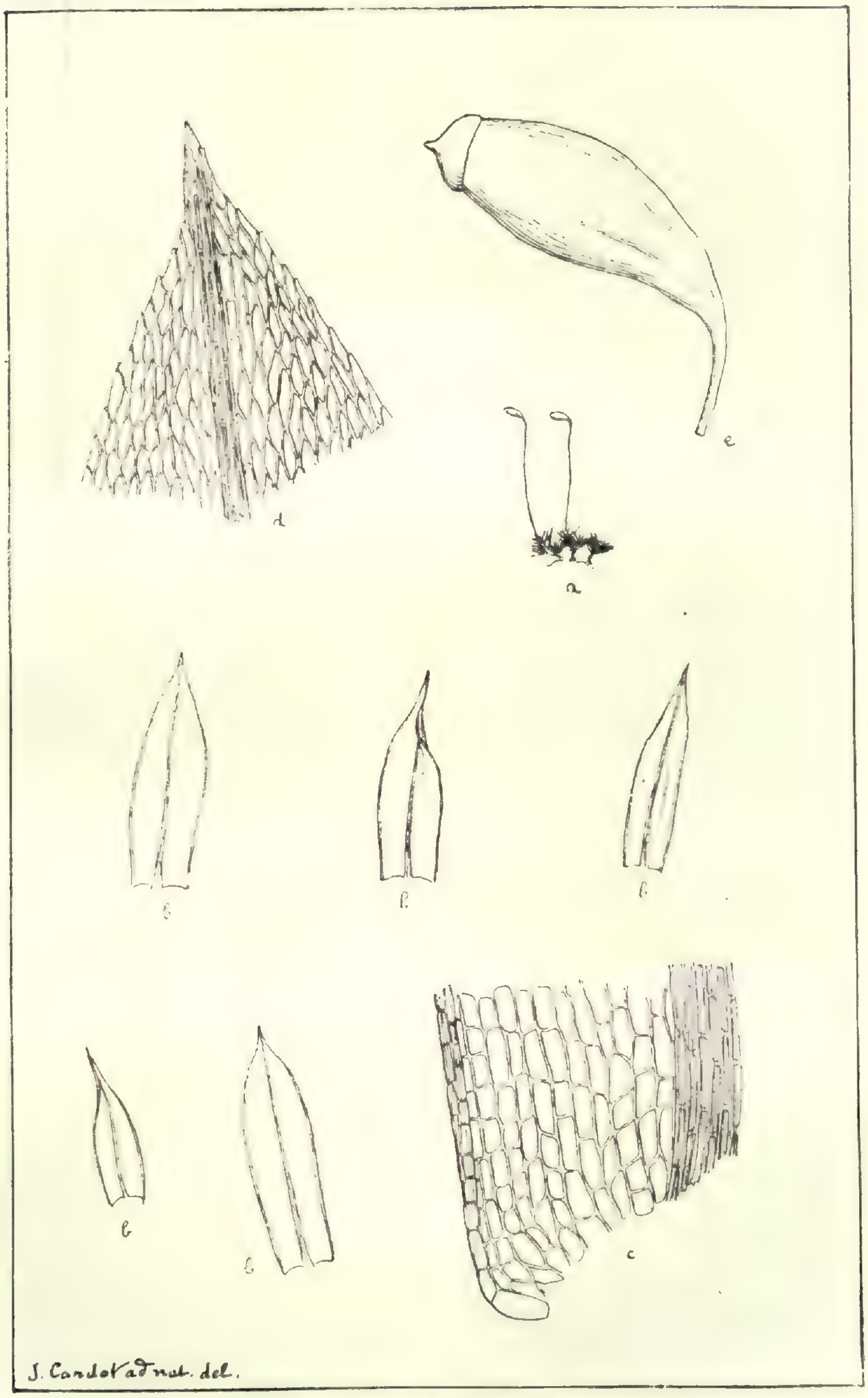
PHILONOTIS OBTUSATA.



ASTRODONTIUM TRELEASEI.



SCIAROMIUM RENAULDI.



BRYUM SERRULATUM.

BOTANICAL OBSERVATIONS ON THE AZORES.

BY WILLIAM TRELEASE.

A three months' leave of absence in the summer of 1894 and a shorter one in the summer of 1896 were utilized in collecting and preparing specimens representing as fully as possible the endemic and naturalized flora of the Atlantic group of islands known as the Azores or Açores.

Situated in mid-ocean, about on the 38th parallel of north latitude, some 700 miles from Portugal, 1,150 from Great Britain, and 1,700 from Newfoundland, and bathed by a branch of the warm Gulf stream, the Azores present at once favorable climatic conditions for the support of a varied vegetation, and remoteness from the continents, promising peculiar and highly differentiated species. Though treated as one archipelago, the nine Azorean islands moreover really form three groups, the central of which (consisting of Fayal, Pico, San Jorge, Graciosa, and Terceira) lies nearly a degree to the south and about 125 miles to the east of the westernmost group (consisting of Corvo and Flores), and nearly a degree to the north and about 90 miles to the west of the easternmost group (consisting of San Miguel and Sta. Maria).

Offsetting the isolation of the Azores and their three subgroups, however, is the fact that frequent ships plying between Portuguese or Mediterranean ports and the United States, and occasional European vessels en route to or from South America, the West Indies, etc., touch at some one of them, while the larger islands are regularly visited twice a month and the smaller ones once a month by packet boats from Lisbon, one of which also touches at Madeira. Between the islands of each group, also, there is very frequent communication by small sailing boats, which sometimes make the passage between the central and eastern groups,

though it is rare for them to cross the greater expanse of water separating the central from the western islands.

The Azores are volcanic cones forming "the highest points of a great plateau-like elevation which extends for upwards of a thousand miles from west to east, and appears to be continuous with a belt of shallow water stretching to Iceland in the north, and connected probably with the 'Dolphin Rise' to the southward — a plateau which in fact divides the North Atlantic longitudinally into two great valleys, an eastern and a western." * Aside from comparatively recent swamp diatomaceous accumulations which Captain F. A. Chaves informs me he has discovered in San Miguel, a certain amount of lignite in the same island, and tufa casts of existing species of higher plants, one island only, Sta. Maria, presents fossiliferous beds. These have been referred to Tertiary time. This island alone is devoid of comparatively recent volcanic cones. The islands, therefore, are of late geological formation, so far as their present surface is concerned. Notwithstanding the comparatively shallow water that, as the Challenger researches show, separates them from one another and extends out on the tableland of the mid-Atlantic, they all drop very abruptly from the shore line to a considerable depth, so that there seems to be no reason for supposing that they have been connected together or joined to the mainland within recent time.†

At sea level, frost is unknown in the Azores, though it is frequently experienced on the higher grounds, where occasional snow or sleet falls. The summer temperature is not very different from that of our Atlantic seaboard in about the same latitude. While the sun commonly rises clear, the higher mountains are usually enshrouded in cloud during the course of the day, and even in the summer season mist and rain are observable almost daily in the higher regions, and are not infrequent at sea-level.

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* Thompson, The Atlantic, a preliminary account of the general results of the exploring voyage of H. M. S. "Challenger." **2**: 23.

† On the geology of the Azores, see, especially, Hartung, Die Azoren. Leipzig. 1860.

METEOROLOGY OF PONTA DELGADA, AZORES.

Month.	Maximum Temperature.	Minimum Temperature.	Relative Humidity.	Number of Rainy Days.	Amount of Rainfall.
Jan	63.5 Fahr.	48.5 Fahr.	75–86%	10	3.69 in.
Feb.....	63.	49.5	80–88	17	5.94
Mar....	65.	46.5	75-83	4	0.47
Apr....	70.	52.	68–72	1	0.11
May	71.5	53.5	73–81	10	3.98
June.....	76.	54.	73–82	8	3.62
July.	79.	61.5	73–78	4	0.79
Aug....	80.5	62.5	67–70	3	0.29
Sept	79.	62.	73–80	4	0.54
Oct.....	78.5	54.	67–73	13	2.55
Nov	69.5	47.5	76–78	14	4.15
Dec	66.	51.	72–83	12	2.01
	80.5	46.5	67–88	100	28.14
	Average 62.6		Average 76		

METEOROLOGY OF ST. LOUIS, MO.

Month.	Maximum Temperature.	Minimum Temperature.	Relative Humidity.	Number of Rainy Days. .01 in. or more	Amount of Rainfall.
Jan.....	62 Fahr.	5 Fahr.	71–81%	7	1.43 in.
Feb.....	75	5	66–78	6	2.81
Mar	74	19	66–78	12	2.03
Apr	88	30	52–73	8	2.43
May.....	91	56	68–80	15	9.12
June.....	91	56	64–82	15	4.57
July.....	98	58	67–80	13	4.67
Aug	100	60	61–78	7	2.12
Sept.....	95	45	71–83	12	2.42
Oct.....	80	36	57–80	8	1.20
Nov	78	13	70–78	13	3.70
Dec	68	17	64–77	4	1.05
	100	5	52–83	120	37.55
	Average 58.3		Aver. 71.9		

METEOROLOGY OF LOGAN, UTAH.

Month.	Maximum Temperature.	Minimum Temperature.	Relative Humidity.	Number of Rainy Days.	Amount of Rainfall.
Jan	50.° Fahr.	—1.° Fahr.		4	1.31 in.
Feb....	58.	8.		2	.35
Mar....	65.	3.		7	1.73
Apr.....	70.	13.	30–85%	9	2.11
May	80.	24.	43–87	15	3.17
June.....	90.	39.	25–65	4	.46
July	97.	51.	29–77	9	1.40
Aug	92.	49.	34–85	3	1.49
Sept.....	88.	35.	34–72	5	.91
Oct.....	81.	30.	27–79	1	.68
Nov	65.	—11.		9	1.97
Dec..	44.	13.		4	.57
	97.	—11.	25–87	72	16.15
	Average 47.1		Average 55		

From the monthly Résumé of the San Miguel Meteorological Observatory, under the direction of Captain F. A. Chaves, the 47th Bulletin of the Agricultural Experiment Station of Utah, and data obligingly furnished by Dr. H. C. Frankenfield of the St. Louis Weather Bureau, the accompanying tables for 1896 have been compiled, to show some of the more obvious differences between an insular and two classes of continental climate, at approximately the same distance from the equator.

The mild moist climate, favorable for the growth of a great variety of plants of subtropical origin, and the easily disintegrated volcanic debris, for the most part abundantly watered by brooks and seepage from the moors above, are offset by the prevalence of strong gales at certain seasons, and the liability to cyclones in late summer and early autumn. These winds, fresh from the ocean, often do much damage, yet the Azores, on the whole, offer great possibilities for the cultivation of plants which in the United States can be grown only in California and the most favored parts of the Gulf States.

The standard agricultural crops are wheat, Indian corn, sweet potatoes, potatoes, and the common vegetables of our own gardens. Lupins are largely grown as a soiling crop, a practice, like many others, traceable back to the Romans. In season, the markets offer strawberries, apricots, melons, and other fruits of temperate climates, in abundance and of good quality, though pears and apples do not impress one usually as being equal to those grown in England or the United States. Grapes of the *vinifera* type, which were at one time largely grown, have been almost exterminated by the *Oidium* and *Phylloxera*, and few if any efforts have been made to replant the vineyards with the best varieties grafted on American roots, as has been done in France. On the contrary, the superior *vinifera* grapes have been replaced largely by inferior derivatives of the *labrusca* stock. As a result, the Azorean wines, which at one time were considered almost, if not quite,

equal to those of Madeira, are now nearly all of extremely inferior quality. In their season, the loquat (*Eriobotrya*) and orange are met with in abundance, and of the best quality, though the famous St. Michael's oranges, like the grapes, have proved so subject to disease that they are now comparatively little grown.

Bananas of the *sapientum* type (called silver bananas), and more commonly those of the *Cavendishi* type, are successfully grown, and though the fruit is of small size, it is generally sweet and of good flavor. Figs of several varieties mature perfectly.

Of late years, the former orange industry of San Miguel has been replaced to a certain extent by the cultivation of pineapples, which are of unusually good quality, and find a ready market in England at a high price. Unlike the fruits heretofore mentioned, these do not thrive in the open air, but require the shelter of glass houses of the general construction of our American commercial plant-houses, but without artificial heat.

The number of decorative plants cultivated out of doors, or capable of open-air cultivation, in the Azores, is extremely large. The islanders, as a rule, are fond of flowers, and even in the cities nearly every bit of ground about the houses, not needed for other purposes, is planted with the common flowers of temperate regions, while now and then such trees as *Magnolia grandiflora* are seen, vegetating luxuriantly and flowering freely. Several of the cities have small public gardens, of which that at Angra, the capital of Terceira, is the most successful. In nearly all of the towns, the more prosperous citizens have amplified the small dooryard flower bed into a garden or quinta of some pretensions, in which one is sure to see growing many of the plants met with in Californian gardens. The surroundings of many suburban places are lavishly embellished in this manner. In the most prosperous island, San Miguel, indeed, are several gardens as extensive as those of less restricted countries, and with as varied vegetation as

the gardens of the Riviera. The most noted of these are the Borges garden and the garden of Sr. José do Canto, in Ponta Delgada, and the large park maintained by the last named gentleman at the lake near the Furnas, or hot baths. In these gardens are to be seen well-grown trees and shrubs from temperate America and Europe, Mexican oaks and agaves, Australian Eucalyptus trees, Indian species of Ficus, myrtles and Proteas from the Cape, giant bamboos, and numerous South American plants.*

So large a variety of plants capable of living through the winter being cultivated, it is not surprising that the quintas and adjacent waysides should be more or less stocked with escaped species, some of which, like the Madeira Vine (*Boussingaultia baselloides*), Passion Flower (*Passiflora coerulea*), and Climbing Fuchsia (*Fuchsia macrostemma*), scarcely do more than take complete possession of walls over some part of which they were probably at first planted; others, like several species of *Mesembrianthemum* on the bluffs below the fort at Angra and along the sides of the drive to the Furnas, and a species of *Protea* shown me on his country estate by Sr. do Canto, merely spread in the vicinity of the original spot where they were cultivated; while others, like *Hedychium Gardnerianum*, *Erigeron mucronatus*, perhaps *Trachelium coeruleum*,† etc., having established themselves, are gradually extending their territory. Owing to the close utilization of the land, trees and shrubs, which are much needed for the firewood that they furnish, have been planted to such an extent in all available nooks and corners, whence they spread to a greater or less extent, that to-day, with few exceptions, it is almost impossible, on encounter-

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* An interesting article on "the gardens and orange-grounds of St. Michael's in the Azores — its climate and peculiarities" was published by P. Wallace, in 1852.

† Of this species I was shown in Flores a cultivated specimen said to have been transplanted from the high interior of the island; but all wild specimens seen by me were in situations suggesting introduction.

ing a woody plant in the agricultural zone, to say whether it is spontaneous or introduced.

More evidently than is the case with the Canary Islands,* the endemic flora of the Azores appears to be undergoing a gradual reduction, partly because of the utilization of all available land for agricultural purposes. In some of the islands, even the high-lying pasture lands are being restocked with forage plants from the European and American continents, in the belief that they are more valuable than those native to the islands; but, as a rule, such changes as are taking place above the zone of cultivation are fought out on the lines of the survival of the fittest. Near the sea level, however, where every square foot of tillable ground is utilized for the cultivation of food crops, the greater number of species met with are cosmopolitan weeds,† evidently of comparatively recent introduction, which here, as elsewhere, exist and spread because of their ability to live in crannies or by the roadside, and to flower and seed precociously and abundantly. Next the sea, and on the omnipresent stone walls and in the most recent volcanic debris, species found elsewhere in similar situations are thoroughly at home, scarcely being interfered with by cultivated plants or the usual field and roadside weeds; but it is observable that the plants of this description that are peculiar to the islands for the most part are of very restricted distribution, localities such as they affect being in large part occupied by plants common to other parts of the world, almost compelling the inference that even here the native species are being crowded aside, and in time will give place to the invaders.

A little over one hundred years ago the first printed account of the botany of the Azores seems to have been published by Forster, and at about the same time, from the

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* Morris, The plants and gardens of the Canary Isles. Journ. Roy. Hort. Soc. **19**: 65.

† On a similar condition in Madeira, see Yate Johnson's Madeira, 3d ed. 225.

collections of Masson, Aiton described a number of Azorean species. Our present knowledge of the subject comes largely from the work of Guthnick, the two Hochstetters and Seubert, H. C. Watson, Drouet, Godman, and the naturalists of the Challenger Expedition. In the contributions published by these men are to be found sufficient references to minor papers.* Just as Seubert's Flora Azorica will always form a necessary starting point for students of the flora of these islands, Watson's account of the flora in Godman's Azores marks a point at which most of the critical difficulties were pointed out and the list of Azorean plants brought to a fair degree of accuracy by the elimination of double entries and synonyms.

As Mr. Watson has shown (l. c., page 262), it is not probable that future collectors will add any considerable number of species to the phanerogams and pteridophytes of the Azores, though a few which have escaped detection thus far because of seasonal or geographical restriction, occasional new introductions, and species heretofore mistaken for others or forming part of ultimately divisible aggregates, will slightly augment the list from time to time. Even with the bryophytes, which M. Cardot believes can easily be doubled, the absolute increase in species is not likely to be at all considerable. With thallophytes, however, the case is quite different. Though perhaps relatively few additions to the lichens will be made, the fungi are practically unstudied, and in moist wooded regions many species should be found; and the marine algal flora, though unquestionably small, may doubtless be increased considerably by collections prosecuted through the entire year, while there is reason to expect a very large number of diatoms and desmids, as well as many representatives of other groups of fresh-water algae, whenever careful collections shall have

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* Such of their works as are referred to in the catalogue of plants, appear in a list appended to the catalogue.

been made, especially from the wet sphagnum with which the highlands are usually covered except in Sta. Maria.

Nearly complete as the list of flowering plants and ferns is believed to be, a true flora of the Azores, even for these higher plants, is yet far from possible. For comparison with other regions, a list like Mr. Watson's, or the one here published, is reasonably satisfactory, but for the islands themselves a detailed local flora, with an analysis of the influences which favor the extended distribution of one species while restricting another to a very limited area, is greatly to be desired. Notwithstanding that the present catalogue makes only a small addition to the known number of species in the higher groups, it is believed that its publication is justified by the exact indication that it gives of the known distribution of the several species by islands; nevertheless my data are too few for the presentation of anything like a full list of localities in the several islands, so that no attempt has been made to do this. To facilitate the studies of future collectors, references have been added to reasonably good and easily accessible descriptions and figures of the species of higher plants, a few readily procurable hand-books being cited for this purpose, when possible, rather than scattered even if more critical and detailed memoirs and monographs. The abbreviations used in these references are explained at the end.

In the preparation of the catalogue, in addition to using my own collections (some 1930 numbers), I have had the privilege of examining of a collection some 435 numbers made in 1894 by Mr. C. S. Brown, chiefly in Fayal, Pico, and San Miguel; the herbarium of the Municipal Museum of Ponta Delgada, San Miguel; and numerous collections made in the latter island by Dr. Bruno T. Carreiro and Dr. C. Machado. While in Terceira, I was allowed to examine and take duplicates from the private herbarium of Dr. J. A. N. Sampaio, and while unfortunately I did not preserve a list of his Terceira species, the

duplicates have enabled me to add this island for a considerable number of species.*

In the catalogue, each specimen that I have examined is noted by my own number or by italicizing the name of the collector, or, in the very few cases in which only a field note was made, by italicizing the name of the island cited. Where neither of these indications of personal observation, nor any specific credit, is given, the localities have been derived from Mr. Watson's treatise in Godman's Azores. As a matter of convenience, except where I have thought differently as to specific limitations, the names of the Index Kewensis † have been adopted for the catalogue. Peculiarly Azorean species are indicated by the use of heavy-faced type. What may be called Atlantic species are indicated by small capitals. Established escapes and the like are entered in lower case type; and doubtful or casual plants are entered in small type.

It is observable that a large percentage of the species referred to on Mr. Watson's authority only, have not been detected since the days of his own collecting and that of Mr. Hunt, a half century ago. Whether these plants not recently collected, but the record of which in most cases is scarcely to be questioned, have become extinct or more local, or, as is probable in some cases, have escaped recent observation because they have not been sought at the right season, must be determined by further studies.

At the end of Mr. Watson's paper (p. 278) is a table showing in part the occurrence of Azorean plants in other floras with which that of the Azores may be compared reasonably. After the thallophytes shall have been more fully studied, the preparation of another and fuller geo-

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* I cannot sufficiently express my gratitude to the gentlemen here named, for their numerous kindnesses, nor to Professor J. Henriques, of the University of Coimbra, through whom I made the acquaintance of those resident in the Azores.

† Jackson, Index Kewensis plantarum phanerogamarum. Oxford. 1893–5.

graphical table will be desirable. It is rather surprising to note that the present list has very little in common with Dr. Roth's list of plants which follow the Atlantic Ocean on the west coast of Europe.*

No difficulty is found in seeing how most of the existing species may have been indroduced by ordinary means, largely through human agency, since the discovery of the islands, for they are so precisely comparable with similarly named species from other parts of the world as to suggest the lapse of a very short time, as time is measured by the evolutionist, since their separation from the parent stock. Some of the species at one time thought to be peculiar to the islands, — *e. g.*, *Solidago sempervirens*, — are now known not to be, so that they naturally fall in with those just mentioned; and notwithstanding the study that has been given to them by a number of careful botanists, others, perhaps, may share the same fate. Only the few species marked by the use of heavy-faced type, therefore, remain as peculiarly Azorean. So far as may be judged from their distribution and affinities, the ancestors of these seem to have been introduced by drift, migratory birds, etc., so long ago as to have allowed descendants in the original habitat and the new home to depart enough from the original type to become clearly separable as species. While some of these peculiar species are limited to one and others to another island or sub-group of islands, the truly native flora, which evidently has always been scanty, has clearly suffered so greatly through the inroads of man and domesticated animals, since the settlement of the Azores, that it is no longer possible to say whether or not these local limitations have always existed. Though it might, perhaps, be expected, no differentiation has yet been shown comparable with that seen in the plants of different islands of the Galapagos group in

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* E. Roth, Ueber die Pflanzen, welche den Atlantischen Ocean auf der Westküste Europas begleiten. Abhandl. bot. Verein Prov. Brandenburg. **25**: 132.

the Pacific,* where specific or varietal differentiation is strongly marked, but where communication between the several islands is far more restricted than in the Azores. For the purpose of showing at a glance the part played by each species of the higher plants, those which compose the bulk of the flora are marked with a large *, and those which are either rather rare or local are marked with a small *. Weeds are marked by a †.

One of the most interesting parts of the study of a limited and isolated flora is its ecology. In this respect the flora of the Azores is particularly disappointing, primarily because of the small number of truly endemic species, and secondarily because, notwithstanding their remoteness from the continents, the islands have for so long a time been stopping points for vessels plying between America and Europe that the probability of the introduction of plant-visiting insects capable of pollinating little-specialized flowers is almost as great as that of the plants themselves.

Comparatively few insects which take part in the pollination of flowers are known to occur in the Azores, and though there are some Syrphidae, and probably a few bees, in addition to what have been indicated,† the number of species and of individuals is unquestionably small. However, observation in bright weather shows that the Apidae and the few flower-frequenting Lepidoptera and flies are sufficiently active to leave no doubt as to the important part they play in pollination. The greater part of the Azorean flowering plants are either anemophilous or adapted to pollination by the aid of little-specialized in-

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* Robinson and Greenman, On the flora of the Galápagos Islands, as shown by the collection of Dr. G. Baur. Am. Journ. Sci. **150** [iv. **50**]: 135.

† From Mr. Godman's Natural History of the Azores, it appears that in 1870 he knew the following Azorean insects: Coleoptera, 212 species (p. 94); Hymenoptera, 13 (p. 101); Lepidoptera, 28 (p. 106). M. Drouet, in his Eléments de la faune açoréenne, further enumerates the following: Orthoptera, 5 species (p. 478); Hemiptera, 6 (p. 479); Diptera, 4 (p. 483).

sects, and, as a rule, they have open flowers with readily accessible nectar or pollen.

In a group of islands possessing only seven species of wild mammals, none of which is peculiar to the islands nor commonly concerned with the dissemination of plants elsewhere, and few birds capable of aiding in this work except for aquatics or marsh plants, it is scarcely to be expected that special dissemination adaptations would be found on the part of aboriginal plants, which presumably have been associated with these animals for a relatively short time, nor of recently introduced plants unless the relations have been established and the modifications worked out before either plant or animal reached the Azores. Hence it comes, for instance, that well developed burrs are found only on evidently recent introductions, and in most cases are obviously less effective than on the continents whence the plants producing them came. By far the greater number of species either possess no special modification adapting them to certain dissemination, but depend upon gravitation, the wind, or hygroscopic movements of their seed vessels, or else their adaptations are out of harmony with their surroundings.

Owing to the limitation of many species to cliffs and walls, they must needs be able to endure considerable drought, and for a protracted period, without serious injury, and this is found to be the case. But by far the greater number of plants showing adaptations to this end are those which had acquired these peculiarities before leaving their original continental home, so that they present few, if any, peculiarities properly claiming attention as a part of their relations to their present surroundings. The same may be said of the structure of strand plants, none of which are peculiar to the Azores, but the details of the distribution of which, nevertheless, would make a most interesting study.*

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* Cf., for instance, Massart, La biologie de la végétation sur le littoral belge. Bull. Soc. roy. de bot. de Belgique, 32: 7.

Though, therefore, the general conclusion must be that the most striking ecological adaptations of Azorean plants are not in relation with their present surroundings, and therefore likely to be injurious, or at the best wasteful, rather than beneficial, there is reason to expect interesting results from a protracted study on the spot of the manner in which these plants may readjust themselves to their new environment.

CATALOGUE OF PLANTS.

Phanerogams.

RANUNCULACEAE.

*RANUNCULUS MEGAPHYLLUS, Steud. *R. grandifolius*, Watson 124. *R. cortusaefolius*, Drouet 155; Seubert 42; Seub. & Hochst. 13; Watson (2) 585, (3) 384.— Lowe, 34.— Bot. Mag. **78**. *pl.* 4625.— *Plate 12.*

Flores (1, 2). Fayal. Pico. San Jorge.

*R. FLAMMULA, L. Watson 124; Drouet 155; B. & H. 8. *f. 12.*

Terceira (4, abundant in a marsh at about 1,000 ft. elevation, two or three miles northeast of Angra).

Of the several forms contrasted by Ewing in Annals of Scott. Nat. Hist. 1894. 236, this is nearest var. *petiolaris*, Lange, Journ. Bot. **27**: 230, not *R. petiolaris*, HBK.

*R. TRILOBUS, Desf. Watson 126, (2) 585; Drouet 155; Seubert 43; Seub. & Hochst. 13.— Lowe, 5.— Desf. Fl. Atl. **1**. *pl. 113.*

Flores. Terceira. San Miguel. Sta. Maria.

*R. PARVIFLORUS, L. Watson 126, (2) 586; Drouet 155; Seubert 43; Seub. & Hochst. 13.— B. & H. 10. *f. 22.*

Flores (3). Fayal. Pico. Terceira. San Miguel. Sta. Maria (3,*a*).

†R. REPENS, L. Watson 125, (2) 585; Drouet 155; Seubert 42; Seub. & Hochst. 13.— B. & H. 9. *f. 18.*

Fayal. Pico. Terceira (5). San Miguel.

*R. MURICATUS, L. Watson 126, (2) 585; Drouet 155; Seubert 43; Seub. & Hochst. 13.— Lowe, 6.— Rchb. **3**. *pl. 22.*

Fayal. San Miguel.

DELPHINIUM AJACIS, L. Watson 126. *D. consolida*, Drouet 156; Seubert 43; Watson (2) 586; Seub. & Hochst. 13.—B. & H. 13. *f. 29.*

Flores. Pico (*Brown*, 1, near gardens).— Quite clearly a garden escape.

*Aquilegia vulgaris, L. Watson 126, (1) 398, (2) 586; Drouet 155; Seubert 43.—B. & H. 12. *f. 28.*

Pico (*Brown*, 2). —A white-flowered variety.

NIGELLA ARVENSIS, L. Watson 126, (2) 586, (3) 394; Drouet 155; Seubert 43; Seub. & Hochst. 13.—Rchb. 4. *pl. 120.*

San Miguel, in or about gardens. — Not recently collected, and probably a garden escape, though in Madeira *N. Damascena* is abundant.

PAPAVERACEAE.

*Papaver somniferum, L. Watson 127; Drouet 156 (incl. *P. setigerum*).— Lowe, 11.— Rchb. 3. *pl. 17.*

Fayal. Sta. Maria.— A garden escape in the former island.

* † P. DUBIUM, L. Watson 128, (2) 586; Drouet 156.— B. & H. 18. *f. 38.*

Corvo (48). Flores (47, 51). Fayal. San Miguel (*Carreiro*).

*†P. RHOEAS, L. Watson 128, (3) 381; Drouet 156.— B. & H. 18. *f. 37.*

Terceira (49; *Sampaio*). San Miguel (50). Sta. Maria (50, *a*).

*CHELIDONIUM MAJUS, L. Watson 128, (2) 586, (3) 394; Drouet 156; Seubert 43; Seub. & Hochst. 13.— B. & H. 19. *f. 42.*

Pico (*Brown*, 18). San Jorge (44). Terceira (45). San Miguel (46; *Brown*, 19).

*†FUMARIA MURALIS, Sonder. Watson 128; Babington, Bot. Gaz. 1: 63, Journ. Linn. Soc. Bot. 4: 157. *F. capreolata*, Drouet 156; Seubert 43; Seub. & Hochst. 13; Watson (2) 586, (3) 384, Phytologist, 3: 805. *?F. officinalis*, Watson 128, (2) 586, (3) 395; Drouet 156; Seubert 43; Seub. & Hochst. 13.— Lowe, 13.— Fl. Danica, 14. *pl. 2473.*

Flores. Fayal (*Brown*, 16). Pico (*Brown*, 17).

Graciosa (40). Terceira (41, 42; *Sampaio*). San Miguel (*Carreiro*, 89).

*† F. Bastardi, Bor.— Corbière, 36.— *Plate 13.*

San Miguel (43; *Carreiro*, 39). Sta. Maria (43, *a*, 43, *b*?).—Scarcely separable from the preceding.

*†F. Boraei, Jord.— Corbière, 35.— *Plate 13.*

San Miguel (*Carreiro*, 136).— Larger flowered than either of the preceding.

These three closely related species are frequently treated as varieties of one, *e. g.* Lange, followed by Colmeiro, Plantas de la Peninsula, 1: 117, under *F. media*, which is sometimes made to comprise the last two as distinct from *F. muralis*, *e. g.* Index Kewensis.

F. densiflora, DC. *?F. micrantha*, Drouet 156; Watson 129.

San Miguel (Drouet).— If really present, may be recognized from its crowded flowers, the short deeply colored corolla scarcely twice as long as and narrower than the almost peltate sepals.

Cruciferae.

*Matthiola incana, R. Br. Drouet 157. *M. annua*, Watson 129, (2) 586; Drouet 156; Seubert 43; Seub. & Hochst. 13.— Corbière, 43.— Rchb. 2. *pl. 45.*

Fayal (*Brown*, 12). Pico? (*Brown*, 13, 14). Terceira (*Sampaio*). San Miguel.

*Nasturtium officinale, R. Br. Watson 130, (2) 586; Drouet 157; Seubert 43; Seub. & Hochst. 13.— B. & H. 27. *f. 52.*

Corvo (6). Flores (7, 8). Fayal. Terceira (9). San Miguel (10; *Brown*, 15). Sta. Maria (10, *a*).

N. flexuosum, Seubert 43; Watson 130, (2) 586, (3) 395; Drouet 157. *N.* nova spec., Seub. & Hochst. 13.

Flores (apparently distributed as Hochstetter, 61).— Not recently recognized, and doubtfully referred to the preceding in Index Kewensis.

***Cardamine caldeirarum**, Guthn. in Seubert 43; Seub & Hochst. 13; Watson 130, (2) 586; Drouet 157. *C. Caldeiraria*, Watson (1) 129.— *Plates 14–15.*

Corvo (16, 17). Flores (11, 12, 13,— the latter from the northern end of the island, a large lax form with the leaflets long-stalked and deeply and acutely palmately lobed, or with an occasional secondary leaflet cut

off at base, approaching *C. maritima*,—*plate 15*). Fayal (*Brown*, 11). Pico. San Miguel.

*C. **caldeirarum, var. amplifolia** n. var.

San Miguel, (14, 15,—in the vicinity of the Furnas, especially abundant and well developed in the large grotto beside Lagoa das Furnas, a short distance above the hot springs; *Carreiro*, at Candellaria).

At length a foot high, slender and lax, spreading by a rather stout root-stock, with sparse white hairs, especially about the bases of the petioles: flowers larger: foliage as in *C. amara:* capsules slender, remote, very divergent on capillary pedicels less than half their length, not surpassing the floriferous end of the stem.— *Plate 16*.

An interesting form with rather larger flowers than the type and leaves most closely resembling those of *C. amara*, but the fruit and habit of the former. From *C. hirsuta* it differs in its larger flowers, and from *C. sylvatica* in its few very spreading capsules.— But the figure of *C. sylvatica* in Rchb. 2. *pl. 26* might almost pass for some forms of *C. caldeirarum*.

*C. HIRSUTA, L. Watson 130, (2) 586, (3) 384; Drouet 157.— B. & H. 32. *f. 66*.

Terceira. San Miguel (*Carreiro*, 135).

*†Barbaraea praecox, R. Br. Watson 130, (2) 586; Drouet 157. *? B. intermedia*, Drouet 157.— B. & H. 27.— Rchb. 2. *pl. 49*.

Fayal. San Miguel.

*†SISYMBRIUM OFFICINALE, Scop. Watson 131, (2) 586; Drouet 157; Seubert 44.— B. & H. 33. *f. 69*.

Corvo (18). *Flores*. Fayal (*Brown*, 10). Graciosa (19). Terceira (21). San Miguel (20; *Carreiro*, 112). Sta. Maria (20, *a*).

All of my specimens belong to a nearly glabrous form, with the capsules usually quite glabrous, which is frequent in the United States.

S. IRIO, L. Watson 131; Drouet 137.— B. & H. 34. *f. 70*.

Fayal (Drouet).— Doubtful.

*ALYSSUM MARITIMUM, L. Watson 131, (2) 587, (3) 395; Drouet 157; Seubert 44.— B. & H. 40. *f. 87*.

Terceira (28). San Miguel.

*†BRASSICA NIGRA, Koch. *Sinapis nigra*, Watson 131, (2), 586; Drouet 157; Seubert 44; Seub. & Hochst. 13.—B. & H. 38. *f. 82*.

Flores (22). Fayal. Terceira (*Sampaio ?*). San Miguel (*Carreiro*, 182 ?).

*†Capsella Bursa-pastoris, Medic. Watson 132, (3) 382; Drouet 158.— B. & H. 45. *f. 101.*

Corvo (39). *Flores*. Terceira. San Miguel (*Carreiro*). Sta. Maria (39, *a*).

*†Senebiera pinnatifida, DC. Watson 131, (2) 587; Drouet 157; Seubert 44; Seub. & Hochst. 13.— B. & H. 48. *f. 108* (as *S. didyma*).

Flores (31, 32). Fayal. Pico (*Brown*, 3). San Jorge (33, 34). Terceira (35). San Miguel (*Brown*, 4, 17; *Carreiro*, 577, *a*). Sta Maria (35, *a*).

S. Coronopus, Poir. Watson 132; Drouet 158.— B. & H. 47. *f. 107.*

Terceira.— Doubtful.

*†Lepidium Virginicum, L. Watson 132, (2) 587; Drouet 158; Seubert 44; Seub. & Hochst. 13.— Lowe, 34.— Rchb. 2. *pl. 10.*

Flores (38). Fayal (*Brown*, 9). Pico. San Jorge (36, 37). Terceira. San Miguel (*Carreiro*, 51).

Iberis umbellata, L.— Rchb. 2. *pl. 7.*

San Miguel (29, in an abandoned quinta).— An escape.

*Rapistrum orientale, DC. Drouet 158.— Rouy & Foucaud, 2: 74.— *Plate 17.*

Terceira (30). Graciosa.

R. perenne, All. Watson 132, (2) 586; Drouet 158.

Fayal.— Doubtful. Should have longer more acuminate fruit than the preceding.— *Plate 17.*

*R. rugosum, All. Watson 133, (3) 381; Drouet 158.— Rouy & Foucaud, 2: 72.—Rchb. 2. *pl. 2.*— *Plate 17.*

Graciosa. San Miguel.— Style considerably longer than the capsule.

*Cakile Americana, Nutt. Watson 133, (2) 586, (3) 385; *C. maritima*, Drouet 158; Seubert 44.— Gray, 74.— Gray, Gen. Illustr. 1. *pl. 74.*

Fayal (*Brown*, 8).— Frequently, as in Index Kewensis, placed under *C. maritima.*

*†Raphanus Raphanistrum, L. Watson 134, (2) 586, (3) 385; Drouet 158.— B. & H. 49. *f. 112. pl. 17.*

Corvo (24, 25). Fayal (*Brown*, 5). Pico (*Brown*, 7). Graciosa (*Brown*, 6). Terceira (23). San Miguel (27; *Carreiro*, 122). Sta. Maria.

R. LANDRA, Moretti. Watson 134.— *Plate 17.*

Flores. Fayal.—Not recently collected.— With stouter capsules having far less conspicuous constrictions and stout conical beak; whereas in the preceding they are usually very slender and always strongly moniliform, the constricted parts sometimes as long as the fertile segments, and the beak is slender and almost linear.

RESEDACEAE.

*RESEDA LUTEOLA, L. Watson 135, (2) 587; Drouet 158.

? R. macrosperma, Seubert 44; Watson (2) 587; Seub. & Hochst. 13.— Lowe, 42.— Rchb. **2.** *pl. 99.*

Corvo (53). Flores (52). Fayal (*Brown*, 23). Pico (*Brown*, 22). Graciosa (54, 55). Terceira (57, 58). San Miguel (56; *Carreiro*, 11). Sta. Maria (56, *a*).

All of my specimens except no. 53 have leaves with undulate margin, and are presumably what Drouet and Watson refer to var. *crispata*. It is not clear that they are really separable from var. *australis*, Müll. Arg., which occurs in the Canary Islands, while the former variety, as understood by Müller, is continental; but it is possible that the varieties are not sharply separable.

VIOLACEAE.

*VIOLA ODORATA, L. Watson 136, (2) 587, (3) 385; Drouet 159; Seubert 44.— B. & H. 54. *f. 121.*

Flores. Fayal. San Miguel (*Brown*, 21).

*V. PALUSTRIS, L. Watson 134, (2) 587; Drouet 159.— B. & H. 54. *f. 120.*

Flores. Pico.— Not recently collected.

V. TRICOLOR, L. Watson 136, (3) 382; Drouet 159; Rchb. **3.** *pl. 21.*

Flores.— Probably escaped; not recently collected.

PITTOSPORACEAE.

PITTOSPORUM UNDULATUM, Vent. Hort. Cels. *pl. 76.*

Sta. Maria (56, *b*, 56, *c*), and seen elsewhere.— The "encenso," long cultivated, and appearing spontaneous, as is the case with most other woody plants, but doubtfully established as truly escaped.

Polygalaceae.

*Polygala vulgaris, L. Watson 136, (1) 402, (2), 587; Drouet 162; Seubert 46; Seub. & Hochst. 14.— B. & H. 56. *f. 126.*

Pico.

P. serpyllacea, Weihe. *P. depressa*, Watson 137; Drouet 162.— Hayne, Arzneigewächse, **13.** *pl. 24.*

Pico. Terceira.— Doubtful.

Frankeniaceae.

*Frankenia pulverulenta, L. Watson 137, (2) 587; Drouet 159; Seubert 44; Seub. & Hochst. 14.— Lowe, 48.— Sibth. Fl. Graeca. *pl. 344.*

Flores (87, 88). Fayal. Pico. Terceira (89). San Miguel (90, 91).

*F. hirsuta, L. *F. ericifolia*, Watson 137, (2) 587; Drouet 159; Seubert 44. *F. laevis*, var. *viridis*, Seub. & Hochst. 14.— Lowe, 48 (as *F. laevis*).— Sibth. Fl. Graeca. *pl. 343.*

Corvo (83, 84, 85, 86, near the shore).

Caryophyllaceae.

*Silene Gallica, L. Watson 138; Drouet 161. *S. Lusitanica*, Watson (2) 587; Drouet 161; Seubert 45; Seub. & Hochst. 14.— Lowe, 50.— B. & H. 63. *f. 137.*

Corvo (97, 98, 99, 100). Flores (94). Fayal. Pico (*Brown*, 24). Graciosa (95). Terceira (93; *Sampaio*). San Miguel (96; *Carreiro*, 11, 49). Sta. Maria (96, *a*).

*S. inflata, Sm. Watson 137; Drouet 161; Seubert 45; Seub. & Hochst. 14. *S. maritima*, Watson (2) 587.— Lowe, 52.—B. & H. 62. *f. 134* (as *S. Cucubalus*).

Corvo (102, 103). Flores (101). Pico. San Miguel.

S. Armeria, L. Watson 138, (3) 383; Drouet 161.— Corbière, 91. — Rchb. **6.** *pl. 284.*

San Miguel.— A garden escape.

***Cerastium Azoricum**, Hochst. in Seubert 45. *pl. 14;* Watson 138, (2) 587; Drouet 160; Seub. & Hochst. 14. Corvo (126 to 131). Flores (120 to 125).

*C. TRIVIALE, Lk. Watson 139. *C. vulgatum*, Seubert 45; Watson (2) 587; Seub. & Hochst. 14; Drouet 160.—Gray, 88 (as *C. vulgatum*); Lowe, 60.—Rchb. **5**. *pl. 229*.

Flores. Fayal. Terceira (119). San Miguel (112, 113, 114; *Brown*, 28).

*C. GLOMERATUM, Thuill. Watson 138. *C. viscosum*, Watson (2) 587; Drouet 160.—Gray, 88 (as *C. viscosum*); Lowe, 60.— Rchb. **5**. *pl. 229* (as *C. vulgatum*).

Corvo (115, 117, 118). Flores. Fayal (*Brown*, 29). Terceira (116). San Miguel (*Carreiro*, 153). Sta. Maria (118, *a*, 118, *b*).

*†STELLARIA MEDIA, Cyrill. Watson 139, (2) 587; Drouet 160.— B. & H. 73. *f. 165*.

Flores. Fayal. Graciosa (92). San Miguel. Sta. Maria (92, *a*).

ARENARIA MUSCOSA, Med. *Moehringia muscosa*, Watson 139; Drouet 160.— Rchb. **5**. *f. 213*.

Terceira.— Doubtful.

*SAGINA PROCUMBENS, L. Watson 139, (2) 587; Drouet 160; Seubert 45; Seub. & Hochst. 14.— B. & H. 65. *f. 146*.

Corvo (132). Flores (133, 134). Fayal. San Jorge (875). Terceira (605; *Abreu*). San Miguel (135, 136, 137, 138; *Brown*, 27; *Carreiro*, 120). Sta. Maria (138, *a*).

*†SPERGULA ARVENSIS, L. Watson 139, (3) 382; Drouet 160.— B. & H. 75. *f. 171*.

Fayal. San Miguel.

*†SPERGULARIA RUBRA, Presl. Watson 140. *Arenaria rubra*, Watson (2) 587, (3) 385; Drouet 160.— B. & H. 74. *f. 170*.

Corvo (139, 140, 141). Flores (142, 143). Fayal. Graciosa (144). San Miguel (*Carreiro*, 9). Sta. Maria (144, *a*).

S. MARINA, Watson 140. *? S. Azorica*, Lebel. *Arenaria marina*, Seub. & Hochst. 14; Drouet 160. *Alsine marina*, Seubert 45, in part. *A. media*, Seub. & Hochst. 14.— Corbière, 110.— Rchb. **5**. *pl. 222* (as *Alsine media*).

Pico. San Miguel.— A slender rooted species, like the preceding, but the flowers should be twice as large, and at least some of the seeds winged.— Doubtful.

*S. MACRORHIZA, Watson 140. *Arenaria macrorhiza*, Drouet 160; Watson (2) 587, (3) 385; Seub. & Hochst. 14. *Alsine marina*, Seubert 45, in part.— Rouy & Foucaud, 305.— *Plate 18*.

Flores. Fayal. Pico. San Miguel (*Hochstetter*, 37; *Carreiro*, 92). Sta. Maria (144, *b*, 144, *c*, 144, *d*).

Were it not for the desirability of following the Index Kewensis, these would all appear under *Tissa*, with the same specific names.

*POLYCARPON TETRAPHYLLUM, L. f. Watson 141, (2) 592; Drouet 159; Seubert 45; Seub. & Hochst. 14.— B. & H. 76. *f. 172*.

Corvo (104, 105, 106). Flores (107, 108). Fayal (*Brown*, 25, 26). Pico (*Brown*, 112). San Jorge (109). Graciosa (110). Terceira (*Sampaio*). San Miguel (111; *Carreiro*). Sta. Maria (111, *a*).

PORTULACACEAE.

*†PORTULACA OLERACEA, L. Watson 141, (2) 592; Drouet 159; Seubert 45. — Lowe, 303. — Gray, Gen. **1**. *pl. 99*.

Corvo. *Flores*. Fayal. Pico (*Brown*, 20). Terceira (145). San Miguel (*Carreiro*, 3). Sta. Maria.

ELATINACEAE.

*ELATINE HEXANDRA, DC. Watson 141, (2) 587; Drouet 161.— B. & H. 78. *f. 176*.

Corvo (318). Flores. San Miguel (*Brown*).

HYPERICACEAE.

Hypericum foliosum, Dryand. Watson 142, (1) 399, (2) 587; Drouet 162; Seubert 46; Seub. & Hochst.

13. *H. grandifolium*, Watson (1) 130. *Androsaemum Webbianum*, Seubert 46; Drouet 162.—Ait. Hort. Kew. **3**: 104.—*Plate 19.*

Corvo (146). Flores (147, 148, 149). Fayal (*Brown*, 44). Pico (*Brown*, 45). *Graciosa*. Terceira (150). San Miguel (151; *Carreiro*, 154). Sta. Maria (151, *a*, 151, *b*).

*H. Baeticum, Boiss. Watson 143. ? *H. tetrapterum*, Drouet 162. ? *H. perforatum*, Drouet 162; Seubert 46; Seub. & Hochst. 13. *H. decipiens*, Watson, Lond. Journ. Bot. **3**: 588, (3) 385, 395; Drouet 162.—Boiss. Voy. Bot. Espagne, **1**: 114. *pl. 34.*

Flores (152, 153). Fayal (*Brown*, 46, 47). Pico. Terceira (154). San Miguel (155, 156; *Brown*, 48; *Carreiro*, 162). Sta. Maria (156, *a*, 156, *b*).—Treated as a form of *H. undulatum* in Index Kewensis, as by Babington, Journ. of Bot. **2**: 97. *pl. 16.*

*H. perforatum, L. Watson 142, (2) 589, (3) 395.—B. & H. 80. *f. 180.*

Terceira.

Differs from the preceding in its terete or only slightly 2-winged stem, less divaricate branches, and larger deeper-colored flowers with the petals more dotted with black.

*H. humifusum, L. Watson 143, (2) 589; Drouet 162; Seubert 46; Seub. & Hochst. 13.—B. & H. 81. *f. 183.*

Corvo (157). Flores (158, 159, 160). Fayal (*Brown*, 49, 188). Pico (*Brown*, 50). Graciosa (161). Terceira (162). San Miguel (163, 164; *Brown*, 51; *Carreiro*). Sta. Maria (164, *a*).

*H. Elodes, Huds. Watson 143; Drouet 162; Watson (3) 382.—B. & H. 82. *f. 188.*—*Plate 20.*

San Miguel (165, Pico do Carvâo, at about 2000 ft. elevation, 166, Lagoa das Furnas; *Brown*, 52).

Malvaceae.

*†Lavatera Cretica, L. *L. sylvestris*, Watson 145, (2) 587; Drouet 161; Seubert 46; Seub. & Hochst. 14.—Lowe, 64.—Cavanilles, Diss. **2**: 89. *pl. 32.*

Flores (79, 80, 81). Fayal (*Brown*, 32, 33?). Pico (*Brown*, 34). San Jorge (77). Graciosa (78). Terceira (76). San Miguel (*Carreiro*, 111). Sta. Maria (76, *a*, 76, *b*).

Fruiting sepals inflexed over the ten carpels.

*MALVA NICAEENSIS, All. Watson 144.— Corbière, 117.— Rchb. 5. *pl. 168*.

Fayal.

A plant of the aspect of the preceding, but with rather smaller flowers, which differs in the technical generic character of having the shorter but still broadly ovate bractlets unconnected into an outer cup, in its open fruiting calyx, and in having the ten mature carpels less rounded on the back, so that the outline of the cluster is less crenated.

*†M. PARVIFLORA, L. Watson 144, (2) 587; Drouet 161.— Lowe, 64.— Cavanilles, Diss. *pl. 26*.

Corvo (74, 75). Fayal. San Jorge (*Brown*, 31). San Miguel. Sta. Maria (75, *a*).

Differs from the last in its glabrous petal claws, narrowly linear bractlets, and carpels with the dorso-lateral margin elevated into a usually toothed wing.

M. ROTUNDIFOLIA, L. Watson 144, (2) 587; Drouet 161; Seubert 46; Seub. & Hochst. 14.— B. & H. 86. *f. 195*.

Fayal, and perhaps other islands.— Doubtful.

Differs in its oblong bractlets, often reflexed fruiting pedicels, and more crenate fruit of about fourteen wingless carpels.

*†SIDA RHOMIBIFOLIA, L. var. CANARIENSIS, Griseb. *S. rhombifolia*, Watson 145, (1) 6, (2) 587; Drouet 161; Seubert 46. *S. Canariensis*, Seub. & Hochst. 14.—Lowe, 69.— Cavanilles, Diss. *pl. 3*.

Flores (73). Fayal (*Brown*, 30). Pico. San Jorge (72). Graciosa (71). San Miguel (*Carreiro*). Sta. Maria (71, *a*).

GERANIACEAE.

*GERANIUM DISSECTUM, L. Watson 146, (2) 589; Drouet 163; Seubert 47; Seub. & Hochst. 13.— B. & H. 93. *f. 211*.

Terceira (173). San Miguel (*Carreiro*, 172). Sta. Maria (173, *a*).

*G. ROTUNDIFOLIUM, L. Watson 145; Drouet 163.—B. & H. 92. *f. 210.*

San Miguel (169, 171; *Carreiro*, 102).

*G. MOLLE, L. Watson 145, (2) 589; Drouet 163.—B. & H. 92. *f. 208.*

Fayal (*Brown*, 35). Graciosa (172). Terceira (168, 170). San Miguel.

*G. ROBERTIANUM, L. Watson 146, (2) 589; Drouet 163; Seubert 47; Seub. & Hochst. 13.—B. & H. 91. *f. 206.*

Flores. Fayal. San Jorge (174). *Terceira*. San Miguel (*Carreiro*, 193). Sta. Maria (174, *a*).

*†ERODIUM MALACHOIDES, Willd. Seubert 47; Watson (1) 397, (2) 589; Drouet 164. *E. malacoides*, Watson 145; Seub. & Hochst. 13.—Lowe, 92.—Rchb. 5. *pl. 185.*

Pico. San Miguel. Sta. Maria (174, *b*).

*†E. MOSCHATUM, L'Her. Watson 145, (3) 382; Drouet 164.—B. & H. 94. *f. 214.*

Terceira (*Sampaio*). San Miguel. Sta. Maria (167, *a*).

*†E. CICUTARIUM, L' Her.—B. & H. 93. *f. 213.*

Terceira (167 — a small specimen from Monte Brazil).

*OXALIS CORNICULATA, L. Watson 146, (2) 589; Drouet 164; Seubert 47; Seub. & Hochst. 14.—B. & H. 95. *f. 217.*

Corvo (175). *Flores*. Fayal. Pico (*Brown*, 36, 209). San Jorge (176). Graciosa (178, 179). Terceira (177). San Miguel (180; *Brown*, 37; *Carreiro*). Sta. Maria (180, *a*).

*†O. purpurea, Jacq. Watson 146, (2) 589; Drouet 164.—Lowe, 101.—Jacq. Oxalis. *pl. 56.*

Fayal? Terceira (*Sampaio*). San Miguel.

Escaping from gardens. In Madeira it has become extremely common.

O. MARTIANA, Zucc.—Lowe, 100.—Bot. Mag. 68. *pl. 3938.*

Fayal (*Brown*, 38).— A garden escape.

RUTACEAE.

*RUTA CHALEPENSIS, L. *R. bracteosa*, Watson 146, (2) 589; Drouet 163; Seubert 47; Seub. & Hochst. 14.— Boissier, Fl. Orient. **1**: 922.— Rchb. **5**. *pl. 156*.

Pico (*Brown*, 54). Terceira (181). San Miguel. Sta. Maria (181, *a*, 181, *b*).

The Brown specimen approaches var. *bracteosa* more closely than do the others.

AQUIFOLIACEAE.

*ILEX PERADO, Ait. Watson 146, (2) 589, (3) 386; Drouet 162; Seubert, 46; Seub. & Hochst. 12.— Lowe, **2**:15.— *Plate 21*.

Flores. Fayal (*Brown*, 41). Pico (*Brown*, 42, 43). Terceira. San Miguel (182, 183, 183, *a*; *Carreiro*).

RHAMNACEAE.

*RHAMNUS LATIFOLIA, L'Her. Watson 146, (2) 589; Drouet 163; Seub. & Hochst. 14; Seubert 47.— Lowe, 111.— Bot. Mag. **53**. *pl. 2663*.

Flores (184, 185). Fayal (*Brown*, 40). San Miguel (186; *Carreiro*). Sta. Maria.

R. PUBESCENS, Banks, MSS. Drouet 163; Watson 146.

Terceira.— Not known further than Drouet's citation.

ANACARDIACEAE.

*RHUS CORIARIA, L. Watson 47, (2) 589; Drouet 163.— Lowe, 113.— Nouveau Duhamel, **2**. *pl. 136*.

Flores (187). Pico (*Brown*, 53). Graciosa (188).

LEGUMINOSAE.

*SPARTIUM JUNCEUM, L. Watson 147, (1) 7, (2) 589; Drouet 167; Seubert 48; Seub. & Hochst. 14.— Corbière, 142.— Bot. Mag. **3**. *pl. 85*.

Flores. Pico (*Brown*, 57). Fayal. Graciosa. Sta. Maria.— Held by Watson, and probably rightly, to be an escape.

*ULEX NANUS, Forst. Watson 147; Drouet 168.— B. & H. 102. *f. 227*.

Flores (191). Terceira (192).

*U. EUROPAEUS, L. Watson 147; Drouet 167.— B. & H. 102. *f. 226.*

San Miguel (193; *Brown*, 55; *Carreiro*). Sta. Maria.

This and the preceding are excluded by Mr. Watson, as probably introduced, in which opinion he is doubtless right, but the specimens collected by me were all truly wild, and in situations such as the species affect on the Continent.

*CYTISUS SCOPARIUS, L. *Sarothamnus scoparius*, Watson 146; Drouet 167; Seubert 48. *Spartium scoparium*, Watson (2) 589; Seub. & Hochst. 14.— Lowe, 122.— B. & H. 104. *f. 231;* Hayne, Arzneigew. 9. *pl. 10.*

Corvo. Flores (196). Fayal (*Brown*, 56). Terceira (194, 195). San Miguel.— Probably an escape, but apparently established

*C. CANDICANS, Lam.— Boissier, Fl. Orient. 2: 54.— Bot. Register. 3. *pl. 217.*

Flores (226). Graciosa (217). San Miguel (218; *Brown*).— Perhaps escaped from cultivation.

*ONONIS ARVENSIS, L. Watson 148, (3) 382; Drouet 168.— B. & H. 105. *f. 232.*

San Miguel.— Not recently collected.

*TRIGONELLA ORNITHOPODIOIDES, DC. Watson 148; Drouet 168.— B. & H. 109. *f. 243.*

San Miguel. — Not recently collected.

*†MEDICAGO LUPULINA, L. Watson 148, (2) 591, (3) 395; Drouet 168; Seubert 48; Seub. & Hochst. 14.— B. & H. 106. *f. 236.*

Graciosa (220). Terceira (219). Sta. Maria (220, *a*).

*†M. DENTICULATA, Willd. Watson 148, (2) 591. *M. pentacycla*, Seubert 48; Watson (2) 591, (3) 395; Seub. & Hochst. 14; Drouet 168. — B. & H. 107. *f. 237.*

Fayal (*Brown*, 58). Terceira (221).

*†M. LAPPACEA, Desr. Watson 148; Drouet 168; Seubert, 48; Seub. & Hochst. 14.— Lowe, 158.— Rchb. 22. *pl. 70* (under *M. denticulata*).

Terceira. San Miguel. Sta. Maria (222, *a*, ? 222, *b*).

Differing, if really distinct, in its less reticulated larger fruit of four or five spires.

*†MELILOTUS INDICA, All. *M. parviflora*, Watson 149, (2) 590; Drouet 168; Seubert 49; Seub. & Hochst. 14.—Lowe, 154.—Rchb. **22.** *pl. 76.*

Corvo (223). San Jorge (222). Terceira. San Miguel.

*TRIFOLIUM ANGUSTIFOLIUM, L. Watson 148, (2) 590; Drouet 168; Seubert 49; Seub. & Hochst. 15.—Lowe, 136 — Rchb. **22.** *pl. 93.*

Fayal (*Brown*, 59). Terceira (236). Sta. Maria (236, *a*).

T. INCARNATUM, L.—B. & H. 110. *f. 244.*

Terceira (Monte Brazil, *Sampaio*).—Probably an escape.

*† T.ARVENSE, L. Watson 149; Drouet 168; Watson (2) 590.—B. & H. 111. *f. 246.*

Corvo (241). Flores (242). Fayal (*Brown*, 61, 62). San Jorge (245). Graciosa (244). Terceira (243). San Miguel (246; *Carreiro*). Sta. Maria (246, *a*).

*T. LIGUSTICUM, Balb. Watson 149, (2) 590; Drouet 168; Seubert 49; Seub. & Hochst. 15.—Lowe, 137.—Rchb. **22.** *pl. 102.*

Corvo (238). Flores (239, 240). Fayal. Pico (*Brown*, 60). San Miguel (*Carreiro*). Sta. Maria (240, *a*).

*T. SCABRUM, L. Watson 149, (2) 590; Drouet 168; Seubert 49; Seub. & Hochst. 15.—B. & H. 112. *f. 253.*

Fayal. Terceira. San Miguel.

A low spreading species, stouter than the last, rough hairy, and with spine-like calyx teeth.

*T. STRIATUM, L. Watson 150; Drouet 169. *T. rariflorum*, Watson 150; Drouet 169.—B. & H. 112. *f. 252.*

Terceira. San Miguel.

Habit of the preceding, softly hairy, the ovoid inflated calyx contracted at apex, its teeth rigid but slenderer.

*T. MARITIMUM, Huds. Watson 150; Drouet 169.—B. & H. 112. *f. 251.*

Terceira? Sta. Maria.

Taller than the preceding, which it resembles, but with usually stalked heads and narrower longer stipules.

*T. LAPPACEUM, L. Watson 150, (2) 590, (3) 395; Drouet 168; Seubert 49; Seub. & Hochst. 15.— Lowe, 138.—Rchb. **22**. *pl. 91*.

Fayal.

*†T. REPENS, L. Watson 150, (2) 590; Drouet 168; Seubert 49; Seub. & Hochst. 15.— B. & H. 114. *f. 260*.

Flores (224). Fayal (*Brown*, 63, 64). Terceira (225). San Miguel (226; *Brown*, 65; *Carreiro*). Sta. Maria (226, *a*).

*T. GLOMERATUM, L. Watson 150, (2) 590; Drouet 168; Seubert 49; Seub. & Hochst. 15.— B. & H. 113. *f. 255*.

Flores (237). Fayal. San Miguel (*Carreiro*). Sta. Maria (237, *a*, 237, *b*, 237, *c*).

*T. SUFFOCATUM, L. Watson 150, (1) 398, (2) 590; Drouet 168; Seubert 49.— B. & H. 113. *f. 256*.

Pico.

*T. CERNUUM, Brot. Watson 151; Drouet 169.— Brotero, Phyt. Lus. **1**: 150. *pl. 62*.

Pico. San Miguel.

*T. RESUPINATUM, L. Watson 151; Drouet 169.— Lowe, 146.— Sturm, **4**. *pl. 16*.

San Miguel.? Sta. Maria (237, *a*).

A species resembling *T. glomeratum* in habit, but with stalked heads and the membranaceous fruiting calyx much enlarged and very veiny.

*T. SUBTERRANEUM, L. Watson 151; Drouet 168.— B. & H. 113. *f. 258*.

Graciosa. San Miguel.

*T. PROCUMBENS, L. Watson 151, (2) 590; Drouet 168; Seubert 49; Seub. & Hochst. 15. *T. campestre*, Drouet 168. *T. agrarium*, Drouet 169.— B. & H. 115. *f. 262*.

Corvo (227, 228). Flores (229, 230, 231). Fayal (*Brown*, 66). Pico (*Brown*, 67). San Jorge (232). Graciosa (233). Terceira (234). San Miguel (235; *Carreiro*, 107, 191). Sta. Maria (235, *a*, 235, *b*).

*T. MINUS, Relhan. Watson 151. *T. filiforme*, Watson (2) 590; Drouet 169.— B. & H. 115. *f. 263.*

Flores. Fayal. San Miguel.— Not recently collected.

*LOTUS ULIGINOSUS, Schk. Drouet 169. *L. major*, Watson 152, (2) 590; Drouet 169; Seub. & Hochst. 14. *L. corniculatus*, *β. major*, Seubert 49.— Lowe, 170.— Engl. Bot. **30.** *pl. 2091.*

Corvo (201, 202). Flores (203). Fayal (*Brown*, 68, 69). Terceira (204, 205, 206, 206, *a*). San Miguel (*Carreiro*, 249, *a*).

L. CORNICULATUS, L. Watson 152, (2) 590; Drouet 169; Seubert 49; Seub. & Hochst. 14.— B. & H. 116.— Engl. Bot. **30.** *pl. 2090.*

Flores. Pico. Terceira. Sta. Maria.— Doubtful as separable from the last.

*L. ANGUSTISSIMUS, L. Watson 152, (2) 590; Drouet 169; Seubert 49; Seub. & Hochst. 14.— B. & H. 116. *f. 266.*

Flores (197, 198). Fayal. Graciosa. San Miguel (199). Sta. Maria (199, *a*, 199, *b*).

*L. HISPIDUS, Desf. Watson 152, (2) 590; Drouet 169; Seubert 40; Seub. & Hochst. 14.— Lowe, 168.— Engl. Bot. *pl. 2823.*

Corvo (247, 248, 249, 250, 251, 252). Flores (253). Fayal (*Brown*, 70, 71). Terceira (254, 255, 256, 257). San Miguel. Sta. Maria (257, *a*).

*L. PARVIFLORUS, Desf. Watson 152, (2) 590. *Dorycnium parviflorum*, Seubert 49; Drouet 169. *? Lotus hispidus*, var., Drouet 169.— Lowe, 167.— Desf. Fl. Atl. **2**: 206. *pl. 217.*

Flores. Fayal. Graciosa? (Drouet). San Miguel (*Carreiro*, 150). Sta. Maria (257, *b*).

*L. CRETICUS, L. Watson 153, (2) 590, (3) 395; Drouet 169; Seubert 49.— Boissier, Fl. Orient. **2**: 164.— Cavanilles, Icon. **2.** *pl. 156.*

Terceira (189, on the beach at Praia).

*L. MACRANTHUS, Lowe. Watson (3) 382, 395; Drouet 169. *Pedrosia macrantha*, Watson 153.— Lowe, 179.

Sta. Maria.— Not recently collected.

*ORNITHOPUS EBRACTEATUS, Brot. Seub. & Hochst. 14. *Arthrolobium ebracteatum*, Watson 153, (2) 591; Drouet 170. *Astrolobium ebracteatum*, Seubert 49.— B. & H. 119. *f. 273.*

Corvo (209, 210). Flores (211, 212). Fayal (*Brown*, 72). Graciosa (213). Terceira (214). San Miguel (200, 215; *Brown*, 73; *Carreiro*). Sta. Maria (215, *a*).

*O. PERPUSILLUS, L. Watson 153, (2) 591; Drouet, 170.— B. & H. 120. *f. 274.*

Corvo (207). Flores. San Miguel. Sta. Maria.

*O. SATIVUS, Brot. *O. roseus*, Watson 153; Drouet 170; Seubert 49; Seub. & Hochst. 15.— Lowe, 184.— Rchb. **22.** *pl. 175, 180.*

Terceira (208, at Angra).

*O. COMPRESSUS, L. Watson 154; Drouet 170.— Lowe, 184.— Rchb. **22.** *pl. 181.*

Sta. Maria (208, *a*).

*VICIA HIRSUTA, S. Gray. Watson (2) 590; Drouet 170. *Ervum hirsutum*, Watson 154. — B. & H. 122. *f. 277.*

Corvo (258). Flores (259). Fayal. Terceira (*Sampaio*). San Miguel.

*V. GRACILIS, Loisel. Seub. & Hochst. 14. *Ervum gracile*, Watson 154, (2) 590. *Ervum tetraspermum*, *β. gracile*, Drouet 169; Seubert 49.— Lowe, 195.— Engl. Bot. *pl. 2904.*

Fayal. San Miguel.

***V. Dennesiana**, Watson 154; Gard. Chronicle, n. s. **19**: 816. *V. Durneriana*, Drouet 170.

San Miguel.

Collected many years ago "on the mountains at the east end of the island, growing on damp earthy precipices."

*V. ATROPURPUREA, Desf. Drouet 170. *V. albicans*, Watson 156, (1) 6, (2) 590; Drouet 170; Seubert 49; Seub. & Hochst. 14.— Lowe, 200. — Bot. Register. **11.** *pl. 871.*

Corvo (260). Flores (261). Fayal (*Brown*, 74, 75). Terceira (262, 263). San Miguel.

My specimens do not agree with Lowe's description of the stipules and number of flowers, nor, in the incision of the stipules, with such specimens of *V. atropurpurea* as I have seen. Of the varieties of Barker-Webb & Berthelot, Hist. Nat. Iles Canaries, 3. 2[2]: 105, these specimens are nearest *β. Linnaeana*.

*†V. SATIVA, L. Drouet 170. *V. angustifolia*, Watson 157, (2) 590; Drouet 170; Seubert 49; Seub. & Hochst. 14.— B. & H. 123. *f. 284.*

Fayal. Terceira (*Sampaio*). San Miguel.

*V. BITHYNICA, L. Watson 157, (3) 382; Drouet 170.— B. & H. 124. *f. 286.*

San Miguel.— Not recently collected.

V. MONANTHOS, Desf. *Ervum monanthos*, Watson 154, (2) 590; Drouet 169.— Lowe, 194.— Sturm, 8. *pl. 32.*

Fayal.— Probably escaped, and not recent.

LENS ESCULENTA, Moench. *Ervum Lens*, Watson 154, (2) 590, (3) 395; Drouet 168; Seubert 49.— Lowe, 191.— Sturm, 8, *pl. 32.*

Fayal.— Probably escaped, and not recent.

*†LATHYRUS APHACA, L. Watson 157, (2) 590; Drouet 170; Seubert 49; Seub. & Hochst. 14.— Lowe, 209.— B. & H. 125. *f. 288.*

Flores (190). Fayal. Pico. San Miguel (*Carreiro*, 99).

L. SATIVUS, L. Watson 157, (2) 590; Drouet 170; Seubert 49; Seub. & Hochst. 14.— Lowe, 210.— Rchb. 22. *pl. 199.*

Fayal.— A garden escape, like the next two.

L. TINGITANUS, L. Watson 158, (2) 590; Drouet 170; Seubert 49; Seub. & Hochst. 14.— Lowe, 213.— Bot. Mag. 3. *pl. 100.*

Fayal (*Brown*, 76). Terceira (*Sampaio*). San Miguel.

*L. CLYMENUM, L. Watson 158. *L. articulatus*, Watson (2) 590; Drouet 170.— Lowe, 214.— Rchb. 22. *pl. 200.*

Fayal. Terceira. San Miguel.

ROSACEAE.

*PRUNUS LUSITANICA, L. Watson 158, (3) 382. *Cerasus Lusitanica*, Drouet 165. — Lowe, 236. — Dillenius, Hort. Elth. *pl. 159.*

San Miguel.

SPIRAEA FILIPENDULA, L. Watson 158, (3) 383; Drouet 165. — B. & H. 131. *f. 302.*

Terceira. San Miguel.—Probably an escape.

*RUBUS RUSTICANUS, Merc. *R. fruticosus*, Watson 159, (2) 591; Drouet 164; Seubert 48; Seub. & Hochst. 14.— Focke, Synopsis Ruborum Germaniae, 179 (as *R. ulmifolius*).— Engl. Bot. *pl. 715.*

Corvo (274, 275). Flores (276, 277, 283). Fayal (*Brown, a, b*). Pico (*Brown, c, d*). Graciosa (278, 279). Terceira (280, 281). San Miguel (282; *Carreiro*, 211). Sta. Maria (282, *a*, 282, *b*).

Dr. W. O. Focke, of Bremen, who was kind enough to examine all of my numbers and those of Mr. Brown, refers them all to the one species, which is also known as *R. ulmifolius* and *R. discolor*. He adds that while nos. 281 and 282 depart a little from the type, in having the two surfaces of the leaf concolorous, suggesting *R. concolor*, Lowe, they look exactly like certain anomalous forms growing in England.

? **R. Hochstetterorum**, Seubert 48; Watson 159, (2) 591, (3) 386; Drouet 164. *R. grandiflorus*, Seub. & Hochst. 14.

Flores. Fayal. Pico. San Miguel.

I should have been disposed to refer my large flowered specimens (nos. 274, 275, 277) to this species, had not Dr. Focke passed on them. As it is, I have no knowledge of *R. Hochstetterorum*.

*FRAGARIA VESCA, L. Watson 159, (2) 591; Drouet 165; Seubert 48; Seub. & Hochst. 14.— B. & H. 136. *f. 311.*

Corvo. Flores. Fayal (*Brown*, 77, 78). Pico. Terceira (269, 270). San Miguel (271, 272; *Carreiro*, 152). Sta. Maria (272, *a*).

*†F. INDICA, L.— Gray, 158.— Bot. Reg. **1**. *pl. 61.*

San Miguel (273; *Carreiro*, 200).

Likely to have been introduced in nursery stock, as in the United States.

*POTENTILLA TORMENTILLA, Neck. Watson 160, (2) 591; Drouet 165; Seubert 48. *Tormentilla officinalis*, Watson (1) 8.— B. & H. 137. *f. 314.*

Corvo (287, 288, 289). Flores (290, 291). Fayal (*Brown*, 79). Pico (*Brown*, 80). Terceira (292). San Miguel (293, 294, 296; *Brown*, 107; *Carreiro*).

No. 295, from the Lagoa das Furnas, San Miguel, has the smaller caudex of the following species, and the lower leaves are petioled, but the flowers are small and corymbose, with only 4 petals, and the leaflets are 3.

*P. PROCUMBENS, Sibth. Drouet 165.—Lowe, 245.—*Plate 22.*

Flores (284, 285). Pico (*Brown*, 81). San Miguel (286; *Carreiro*, 198). Sta. Maria (286, *a*).

P. REPTANS, L. Watson 160, (2) 591; Drouet 165; Seubert 48; Seub. & Hochst. 14. *? P. Tormentilla*, ε. *nemoralis*, Seubert 48; *? Tormentilla reptans*, Watson (1) 400.—B. & H. 137. *f. 313.*

Pico.— Doubtful as different from the preceding.

P. VERNA, L. Watson 161; Drouet 165.—B. & H. 138. *f. 316.*

Sta. Maria.— Regarded with doubt by Mr. Watson.

P. ANSERINA, L. Watson 159, (2) 591, (3) 395; Drouet 165; Seubert 48; Seub. & Hochst. 14.—B. & H. 138. *f. 318.*

Reported by Seubert as "ubique in pascuis siccoribus et ad vias," but not since observed.

*†ALCHEMILLA ARVENSIS, Scop. Watson 161, (2) 591; Drouet 165.—B. & H. 141. *f. 324.*

Corvo (593). Fayal. Terceira (594, 595). San Miguel (596; *Carreiro*, 7).

*†AGRIMONIA EUPATORIA, L. Watson 161, (2) 591; Drouet 165; Seubert 48; Seub. & Hochst. 14.—B. & H. 142. *f. 327.*

Flores (266). Fayal (*Brown*, 82, 83). Pico (*Brown*, 84, 85), Graciosa. Terceira (*Sampaio*). San Miguel (267, 268; *Carreiro*).

POTERIUM SANGUISORBA, L. Watson 161, (2) 591, (3) 395; Drouet 165; Seubert 48; Seub. & Hochst. 14.—B. & H. 141. *f. 326*

San Miguel.— Doubtful.

CRASSULACEAE.

*TILLAEA MUSCOSA, L. Watson 162, (1) 398, (2) 592; Drouet 173; Seubert 42; Seub. & Hochst. 14.—B. & H. 159. *f. 358.*

Flores. Fayal. Pico. San Miguel. — Not recently collected.

*BRYOPHYLLUM CALYCINUM, Salisb.— Bot. Mag. **34.** *pl. 1409.*

San Miguel (303,— escaping from cultivation).

*Cotyledon Umbilicus, L. *Umbilicus pendulinus*, Watson 162, (2) 592; Drouet 173; Seubert 42; Seub. & Hochst. 14.— B. & H. 159. *f. 359.*

Flores. Fayal (*Brown*, 86). Graciosa (300; *Brown*, 87 — toward the next species). Terceira (301). San Miguel. Sta. Maria (301, *a*).

*C. horizontalis, Guss. *Umbilicus horizontalis*, Drouet 172.— Boissier, Fl. Orient. **2**: 770.— Refugium Bot. **5**. *pl. 297.*

Corvo (297). Flores (298, 299). San Miguel (302). Sta. Maria (302, *a*).

Often held to be an inconstant form of the preceding.

*Sempervivum villosum, Ait. *Aichryson villosum*, Watson 162, (3) 382; Drouet 173.— Lowe, 330.— Bot. Mag. **43**. *pl. 1809.*

Sta. Maria (303, *a* — abundant on the cliffs above San Lorenzo).

Halorageae.

*Myriophyllum alterniflorum, DC. Watson 162, (3) 382; Drouet 167.— Corbière, 241.— Engl. Bot. *pl. 2854.*

San Miguel (304!, 305!; *Brown*, 88,— at Sete Cidades: 306? ; *Brown*, 89?, — at Lagoa das Furnas — these also pretty clearly this species, but unfavorably grown and not in flower).

*Callitriche stagnalis, Scop. *C. verna*, Watson 163, (2) 591; Drouet 191; Seubert 27; Seub. & Hochst. 14.— Corbière, 243.— Rchb. **5**. *pl. 129.*

Corvo (307, 308?). Fayal (309?, 309, *a*, 310?, 311?, 312? 313). Pico. Terceira (314, 315?, 315, *a*, 316). San Miguel (317; *Brown*). Sta. Maria (317, *a*, 317, *b*, 317, *c*).— The questioned numbers, while evidently the same as the others, are sterile.

MYRTACEAE.

*MYRTUS COMMUNIS, L. Watson 163, (3) 382, 383; Drouet 166.— Lowe, 267.— Hayne, Arzneigew. **10**. *pl. 36*.

Fayal? San Miguel (66, 67; *Carreiro*). Sta. Maria (67, *a*).

LYTHRACEAE.

*PEPLIS PORTULA, L. Watson 162; Drouet 164; Seubert 47; Watson (2) 592.— B. & H. 157. *f. 356*.

Flores (319). Fayal. Pico. Terceira (320). San Miguel (322, 323; *Carreiro*, 67, 824).

This is the variety *longidentata*, Gay, as distinguished by Dunn in Journ. Bot. **34**: 478.

*LYTHRUM HYSSOPIFOLIA, L. Watson 164, (2) 591; Drouet 164; Seubert 47; Seub. & Hochst. 14.— B. & H. 156. *f. 355*.

Corvo (324, 325, 326, 327). Flores (328, 329, 330, 331, 332). Fayal? Pico? Terceira? San Miguel (*Carreiro*). Sta. Maria (332, *a*).

*L. GRAEFFERI, Tenore. Watson 164, (2) 591; Drouet 164; Seubert 47; Seub. & Hochst. 14.— Lowe, 278.— Loddiges, Bot. Cab. **14**. *pl. 1338*.

Pico. San Jorge (*Brown*, 90). Terceira (333). San Miguel (334). Sta. Maria?

ONAGRACEAE.

*EPILOBIUM PARVIFLORUM, Schreb. Watson 164, (2) 591; Drouet 166.— B. & H. 151. *f. 343*.

Flores (335, 336, 337, 338, 339).— Also reported from San Miguel, but probably referring to the next.

*E. OBSCURUM, Schreb. *?E. Miguelense*, Léveillé, Le Monde des Plantes, **3**: 91. *f. on p. 89*.— Lowe, 274.— Rchb. Icon. Crit. **2**. *pl. 199*.

San Miguel (340, 341, 342, 343, 344; *Carreiro*, 3, 36, 212; *Brown*, 91).

Possibly this comprises two species, but I am unable to separate them in the material I have seen.

FUCHSIA MACROSTEMMA, Ruiz & Pavon.— Lowe, 270.— Bot. Mag. **3.** *pl. 97* (both as *F. coccinea*).

Flores (345).—Subspontaneous on walls.

*Oenothera longiflora, L. Drouet 167.— Lowe, 275.— Bot. Mag. **11.** *pl. 365.*

Flores (Sta. Cruz, in gardens). Fayal (*Brown*, 95). Pico (*Brown*, 96). San Miguel (346, at Sete Cidades; *Brown*, 92).— An escape, but seemingly established, as in Madeira.

O. TETRAPTERA, Cav. Drouet 167.— Lowe, 276.— Bot. Mag. **13.** *pl. 468.*

San Jorge.— Apparently only once collected here, but established in Madeira.

O. ROSEA, Ait.— Bot. Mag. **10.** *pl. 347.*

Fayal (*Brown*, 93, 94, 97). San Miguel (*Carreiro*, 90).— Escaped.

MESEMBRIANTHEMACEAE.

MESEMBRIANTHEMUM EDULE, L.— Lowe, 309.

Terceira (347). *San Miguel.*— Escaping.

One other undetermined species was seen in the last named island, under similar circumstances, along the road to the Furnas.

PASSIFLORACEAE.

PASSIFLORA CAERULEA, L. Watson (1) 6.— Lowe, 295.— Bot. Mag. **1.** *pl. 28.*

Flores (349). Fayal.— Spreading somewhat, from cultivation.

CUCURBITACEAE.

*†ECBALLIUM ELATERIUM, Rich. Watson 164. *Momordica Elaterium*, Drouet 167.— Bot. Mag. **44.** *pl. 1914.*

Terceira (348). Sta. Maria (348, *a*).— Abundant about the cities, toward the seashore, on both islands.

UMBELLIFERAE.

*Hydrocotyle vulgaris, L.— B. & H. 178. *f. 396.*

Flores (651, pools in the center of the island).

***Sanicula Azorica,** Guthn. Seubert 41. *pl. 15*; Watson 164, (2) 592; Drouet 170; Hooker, Insular Floras 15; Seub. & Hochst. 13. *S. ciliaris*, Watson (1) 129.

Fayal. Pico. Terceira. San Miguel (354, 355; *Carreiro*). Sta. Maria (355, *a*).

*Conium maculatum, L. Watson 165, (3) 382; Drouet 172.— B. & H. 202. *f. 451.*

San Miguel. Sta. Maria (355, *a*).

*Smyrnium Olusatrum, L. Watson 165, (3) 382; Drouet 172.— B. & H. 203. *f. 453.*

Fayal, San Miguel.— Not recently collected.

*Apium graveolens, L. Watson 165, (2) 593; Drouet 171.— B. & H. 181. *f. 402.*

Corvo (378). Flores (379). Fayal (*Brown*). Pico. Graciosa. Terceira (380, 381). San Miguel.

*A. nodiflorum, Reichenb. *Helosciadium nodiflorum*, Watson 165, (2) 593; Drouet 171; Seubert 42. *H. repens*, Seub. & Hochst. 13. — B. & H. 182. *f. 403.*

Terceira (376). San Miguel (*Chaves; Carreiro*). Sta. Maria (376, *a*, 376, *b*).

Represented by several forms.

*Ammi Visnaga, Lam. Watson 165, (3) 382; Drouet 171.— Lowe, 353.

San Miguel. Sta. Maria.

*A. **Huntii**, Watson, Lond. Journ. Bot. **6**: 382, 383, 384, (4) 166; Drouet 171.— *Plate 23.*

Pico? San Miguel (377, at Lagoa das Furnas).— Small plants of what may be this species also on Sta. Maria (377, *a*).

*A. majus, L. Watson 166; Drouet 171.— Lowe, 349.— Rchb. **21**. *pl. 1864.*

Flores. Graciosa.

*A. **Seubertianum**. *Petroselinum Seubertianum*, Watson Lond. Journ. Bot. **6**: 386, 387, (4) 167. *Kundmannia Sicula*, Seub. & Hochst. 13; Seubert 42; Drouet 172. *Kudmannia Sicula*, Watson (2) 593, (3) 395. *Umbellifera* 100, Watson (2) 592.— *Plate 24.*

Corvo (373, 374). Pico. San Miguel (*Brown*, 102?). Sta. Maria (374, *a*).

This and the following, described as species of *Petroselinum* by Watson, because of their undivided involucral leaves, are nevertheless placed in *Ammi* by Bentham and Hooker, Gen. Plant. 1:

889, so that those authors are virtually responsible for the binomial here used though they do not actually employ it. Both species appear to have been lost from the Index Kewensis.

*A. **trifoliatum.** *Petroselinum trifoliatum*, Watson, Lond. Journ. Bot. **3**: 593, (4) 166; Drouet 170.— *Plate 25.*

Flores. (375).

Mr. Watson, p. 166, refers to another Flores plant resembling this species, but intermediate in leaves and general appearance between *A. Huntii* and *A. majus*.

*Carum Petroselinum, B. & H. *Apium Petroselinum*, Seub. & Hochst. 13. *Petroselinum sativum*, Watson 167, (2) 593, (3) 395; Drouet 171; Seubert 42.— Lowe, 347.— Engl. Bot. *pl. 2793.*

Flores (368). San Jorge (371). Graciosa (372? — a plant with the lobes of the trifid upper leaves broader than usual). San Miguel (*Carreiro*).

*Pimpinella villosa, Schousb. Watson 167; Drouet 171.— Willkomm & Lange, Prodr. Fl. Hisp. **3**: 97. — Brotero, Phyt. Lusit. *pl. 35* (as *P. bubonoides*).

San Miguel.— Not recently collected.

Carum dichotomum, B. & H. *Pimpinella dichotoma*, Watson 168, 169, (2) 593, (3) 395; Drouet 171; Seubert 42.— Wilkomm & Lange, Prodr. Fl. Hisp. **3**: 96.

Pico.— Regarded with some doubt by Mr. Watson.

*Chaerophyllum Azoricum, n. sp. *C. aromaticum*, Watson 168, (2) 593; Drouet 172.— *Plate 26.*

Flores (370 — at Mosteiros, also reported from San Pedro by Watson). San Miguel.

Perennial: stout and coarse, a couple of feet high: stem somewhat purplish, glabrous or with a few short hairs at the nodes: cauline leaves short-petioled, deltoid, a span long and wide, bipinnate and with the lowest segments often pinnatisect; segments crisped, infolded, or overlapping, acute, setulously biserrate, very veiny and somewhat pubescent beneath; petiole-sheaths and rachis coarsely and retrorsely white-hairy: umbels subcorymbose, their stout peduncles subtended by reduced leaves or the uppermost naked, compound, without primary involucre; umbellets dense, stout peduncled, the involucre of broadly white-margined ciliate and somewhat pubescent bractlets: flowers white: fruit glabrous, obconical-oblong, 12 mm. long; styles and broadly conical stylopodium of about equal length.— More closely related to *C. hirsutum* than to *C. aromaticum*.

*Foeniculum vulgare, Mill. Watson 168, (2) 592; Drouet 171; Seubert 42. *Anethum Foeniculum*, Seub. & Hochst. 13.— B. & H. 192. *f. 426.*

Corvo. Flores (367). Fayal (*Brown*, 101). Graciosa (366). *Terceira. San Miguel.*

*Crithmum maritimum, L. Watson 168, (2) 592; Drouet 171.— B. & H. 194. *f. 431.*

Corvo (362). Flores (363, 364). Fayal. Pico. San Jorge (365). San Miguel (*Carreiro*, 4).

*Angelica sylvestris, L. *A montana*, Watson 169; Drouet 172.— B. & H. 194. *f. 432.*

Terceira.— Collected but once.

Coriandrum sativum, L. Watson 169, (3) 382; Drouet 172.— Lowe, 376.—Sturm, 1. *pl. 3.*

Terceira. San Miguel.— Probably escaped.

*†Daucus Carota, L. Watson 169, (3) 382, 383; Drouet 172. *D. neglecta*, Drouet 172. *D. polygamus*, Seubert 42; Watson (2) 592, (3) 386; Drouet 172.— B. & H. 202. *f. 450;* Lowe, 367.

Flores (356, 359). Fayal (*Brown*, 98). Graciosa (360). Terceira (357, 358, 361). San Miguel (*Carreiro*, 72, 74, 168, 195). Sta. Maria (361, *a*).

Several forms, on the separability of which I can reach no satisfactory conclusion.

*†Caucalis arvensis, Huds. Seub. & Hochst. 13. *Torilis tenuifolia*, Watson 170. *T. Helvetica*, Drouet 172; Seubert 42. *T. infesta*, Watson (2) 592.— B. & H. 201. *f. 447;* Lowe, 370.— Sturm, 20. *pl. 93.*

Fayal (*Brown*, 99). Pico (*Brown*, 99, *a*). San Jorge (382, 382, *a*). Graciosa (383, 384). Terceira (*Sampaio*). San Miguel (385; *Brown*, 100; *Carreiro*, 40, 169). Sta. Maria (385, *a*, 385, *b*).

Thapsia decipiens, Hook.f. Bot. Mag. 93. *pl. 5670.* ***Melanoselinum decipiens***, Watson 170, (2) 592; Drouet 172.

Fayal.— Discredited by Mr. Watson.

Araliaceae.

*Hedera Canariensis, Willd. Watson 170. *H. Helix*, var. *Hibernica*, Drouet 172; Watson (2) 592. *H.*

Helix, Seub. & Hochst. 13; Seubert 42.— Seeman, Journ. Bot. **2**: 304.— *Plate 27.*

Corvo (352). Flores (350, 351). Fayal (*Brown*, 103, 104, 105). Pico (*Brown*, 106). San Miguel (353; *Carreiro*). Sta. Maria (353, *a*).

Caprifoliaceae.

*Sambucus nigra, L. Watson 173, (2) 593; Drouet 172.— B. & H. 208. *f. 460.*

Corvo (387). Flores (386). Fayal (*Brown*, 108). Pico (*Brown*). *Terceira*. San Miguel (*Brown*).

Frequent along fences, as noted by Drouet.

***Viburnum Tinus**, var. **subcordatum**, n. var. *V. Tinus*, Watson 172, (2) 593, (3) 387; Drouet 173; Seub. & Hochst. 13. *V. Tinus*, *β. lucidum*, Seubert 35.— *Plate 28.*

Corvo. Flores (389, 390). Fayal. San Miguel (388; *Carreiro*). Sta. Maria (390, *a*, 390, *b* — a very pubescent form).

Characterized by its round-ovate obtuse subcordate leaves, often densely hairy in the axils beneath.—Apparently more closely related to the Canary Island *V. rigidum* than to the true *V. Tinus* of the Mediterranean region.

Leycesteria formosa, Wall.— Bot. Reg. n. s. **2**. *pl. 2.*

San Miguel (776; *Brown, d*).—Thoroughly established near the Furnas, and very beautiful in late summer.

*Rubia angustifolia, L. *R. splendens*, Watson 173, (2) 594; Drouet 180; Seubert 34; Seub. & Hochst. 13.— Lowe, 400.— Rchb. **17**. *pl. 133.*

Corvo (391). Flores (392, 393). Fayal (*Brown*, 109). Pico (*Brown*, 110). San Miguel (394, 395). Sta. Maria (395, *a*, 395, *b*, 395, *c*).

Galium Mollugo, L. Watson 173, (2) 594, (3) 395; Drouet 179; Seubert 34; Seub. & Hochst. 13.— B. & H. 214. *f. 474.*

Indefinitely reported, and considered doubtful by Mr. Watson.

*G. palustre, L. Watson 174, (2) 594; Drouet 180; Seubert 34. *G. debile*, Drouet 180.— B. & H. 214. *f. 471.*

Flores (402). Fayal (*Brown*, 111). San Miguel.

*G. PARISIENSE, L. *G. Anglicum*, Watson 174, (2) 594; Drouet 180; Seubert 34; Seub. & Hochst. 13.—B. & H. 215. *f. 475;* Lowe, 393.

Corvo. Flores. Fayal. Pico. Terceira (403, 404). San Miguel (*Brown*, 113). Sta. Maria (404, *a*).

The variety *leiocarpum* of Lowe, *l. c.*

*G. APARINE, L. Watson 175, (2) 594; Drouet 180; Seubert 34; Seub. & Hochst. 13.—B. & H. 215. *f. 477.*

Fayal (*Brown*, 114). San Miguel.

*G. MURALE, All. *Aspera muralis*, Watson 175.—Lowe, 399.— Allioni, Fl. Pedem. 3. *pl. 77.*

San Miguel.—Collected many years ago.

*SHERARDIA ARVENSIS, L. Watson 175, (2) 594; Drouet 180; Seub. & Hochst. 13; Seubert 35 (as var. *pubescens*, Hochst.).—B. & H. 217. *f. 481.*

Corvo (397). Flores (396, 399). Fayal. Pico (*Brown*, 115). San Jorge (398). Terceira (400). San Miguel (401; *Carreiro*). Sta. Maria (401, *a*).

VALERIANACEAE.

*VALERIANELLA DENTATA, Poll. Watson 175, (2) 594. *Fedia dentata*, Drouet 174.—B. & H. 220. *f. 489.*

Pico.—Not recently collected.

CENTRANTHUS SIBTHORPII, Heldr. & Sart.—Boissier, Fl. Orient. 3: 91.—Sibth. Fl. Graeca. 1. *pl. 29* (as *Valeriana angustifolia*).

Flores. Fayal (*Brown*, 116). San Jorge (*Brown*, 117). *Terceira.* San Miguel (405).—Becoming established as a garden escape.

DIPSACEAE.

***Scabiosa nitens**, Roem. & Sch. Syst. 3: 82; Watson 175 in part, (2) 594, (3) 395; Drouet 174; Seubert 30; Seub. & Hochst. 13. *? S. lucida*, Drouet 174.—*Plate 29.*

Flores (409, 412—with nearly white corolla and purple style). ? San Jorge (Drouet). San Miguel (410—with blue-purple flowers).

*S. MARITIMA, L. *S. atropurpurea*, Drouet 174. *? S. ochroleuca*, Drouet 174. *S. lucida*, Drouet 174. *? S. neglecta*, Seubert 30; Watson (2) 594, (3) 395; Drouet 174.— Lowe, 409.— Bot. Mag. 7. *pl. 247.*

Fayal (*Brown* 118, 119, 120). Terceira (413; *Sampaio*). Sta. Maria (413, *b*).

COMPOSITAE.

*Eupatorium glandulosum, HBK.— Lowe, 435 (as *E. adenophorum*).— Bot. Reg. **20**. *pl. 1723.*

Terceira (413, *a*).

Escaping, as it has done in Madeira, where it is an abundant roadside weed.

*Solidago sempervirens, L. Hemsley, Bot. Challenger, **1**[1]: 12, 40. *S. Azorica*, Hochst. in Seubert 31. *pl. 10;* Watson 178, (2) 602; Drouet 174; Seub. & Hochst. 12. *S.* sp.,Watson (1) 130.— Gray, 248.

Corvo (414). Flores (415, 416). Fayal. Pico. Graciosa (*Brown*, 132). Terceira. San Miguel (417).

*BELLIS PERENNIS, L. Watson 178.— B. & H. 230. *f. 502.*

Terceira (418, 419; *Sampaio*).— Abundant at 1000 to 2000 feet elevation, above Angra.

***B. Azorica**, Hochst. in Seubert 31. *pl. 9;* Drouet 174; Watson (1) 408; Seub. & Hochst. 12. *Seubertia Azorica*, Watson, Lond. Journ. Bot. **3**: 602, (4) 178. *Vidalia Azorica*, Watson 179.

Corvo. Flores. Fayal. Pico (*Hochstetter*, 101). Terceira. San Miguel (*Carreiro*, 2).

*†ERIGERON CANADENSIS, L. Watson 178, (2) 602; Drouet 175.— B. & H. 229. *f. 500.*

Corvo. Flores (420, 421, 422). Fayal (*Brown*, 133). Pico (*Brown*, 134). Graciosa (423). Terceira (*Sampaio*). San Miguel (*Brown*, 135; *Carreiro*).

*E. mucronatus, DC.— Meehan, Native Fl. & Ferns of U. S. ii. **2**: 73. *pl. 18.*

San Miguel (135, *a*, on the road to the Furnas; 135, *b*, about the Furnas, especially along the Ribeira Quinta; *Brown*).— Escaped, but now thoroughly established.

*†E. LINIFOLIUS, Willd. *Conyza ambigua*, Watson 178, (2) 602; Drouet 175; Seubert 32; Seub. & Hochst. 12.— Lowe, 437.— Rchb. **16**. *pl. 22*.

Corvo. Flores. Fayal (*Brown*, 136, 169). San Jorge (424). Graciosa (425, 426). San Miguel (*Carreiro*). Sta. Maria (426, *a*, 426, *b*).

*FILAGO GALLICA, L. Watson 181, (2) 602; Drouet 176; Seubert 32; *Gnaphalium Gallicum*, Seub. & Hochst. 12.— B. & H. 231. *f. 505*.

Fayal. Terceira (*Sampaio*). San Miguel (*Carreiro*).

*F. GERMANICA, L. Watson 181, (2) 602; Drouet 176; Seubert 32; *Gnaphalium Germanicum*, Seub. & Hochst. 12.— B. & H. 231. *f. 503*.

Corvo (427). Flores (428). Fayal. Terceira (429). San Miguel (*Carreiro*, 215).

*GNAPHALIUM LUTEO-ALBUM, L. Watson 181, (2) 602; Drouet 176; Seubert 32; Seub. & Hochst. 12.— Lowe, 484.— Sturm, **10**. *pl. 38*.

Corvo (430). Flores (431). Fayal. Pico (*Brown*, 137). Graciosa. Terceira (432, 434?). San Miguel (433; *Brown*, 138, 139; *Carreiro*, 13).

*G. PURPUREUM, L. *G. Pennsylvanicum*, Watson 181, (2) 602, (3) 396; Drouet 176; Seubert 32; Seub. & Hochst. 12.— Gray, 269.— Dillenius, Hort. Elth. *pl. 109*.

Fayal. Terceira (*cf.* 434). San Miguel (435; *Brown*, 140).

*†XANTHIUM STRUMARIUM, L. Watson 183, (2) 603; Drouet 175.— B. & H. 236. *f. 518*.

Flores. San Miguel.— Not recently collected.

*†X. SPINOSUM, L. Watson 183, (3) 382; Drouet 175.— Corbière, 374.— Rchb. **19**. *pl. 1575*.

San Miguel.— Not recently collected.

*†Bidens pilosa, L. *B. leucantha*, Watson 182, (2) 602, (3) 391; Drouet 175; Seubert 32; Seub. & Hochst. 12.— Lowe, 474 (as *Kerneria pilosa*).— Lamarck, Encycl. Meth. **3.** *pl. 668.*

Fayal. Pico (*Brown*, 141), San Jorge (437). *Terceira.* San Miguel (436).

*Achillea Millefolium, L. Watson 180.— B. & H. 241. *f. 531.*

Flores? (In cultivation, said to have been transplanted from the mountains). San Miguel (Collected only once).

Santolina Chamaecyparissias, L. Watson (2) 602; Drouet 175; Seubert 82.— Hayne, Arzneigew. **6.** *pl. 19.*

San Miguel.— An escape, not recently collected.

*†Anthemis Cotula, L. Watson 180, (2) 602; Drouet 175; Seubert 32; Seub. & Hochst. 13.— B. & H. 239. *f. 526.*

Corvo (438). *Flores.* Fayal. Graciosa (439). Terceira (441, 447?). San Miguel (440; *Brown*, 142; *Carreiro*, 12, 164, 219). Sta. Maria (440, *a*).

A. arvensis, L. Watson 180; Drouet 175.— B. & H. 240. *f. 527.*

Pico. San Miguel.— Regarded with doubt by Mr. Watson.

*A. nobilis, L. var. aurea, DC. *A. aurea*, Watson 180, (2) 602; Drouet 175; Seubert 32; Seub. & Hochst. 13.— Lowe, 467 (as *Ormenus nobilis*).— *Plate 30.*

Flores (442, 443). Fayal (*Brown*, 145). Pico (*Brown*, 143). Terceira (444). San Miguel (445, 446; *Brown*, 144; *Carreiro* 224). Sta. Maria (446, *a*, 446, *b*).

*Chrysanthemum Myconis, L. Watson 179, (2) 602. *C. Myconi*, Seub. & Hochst. 13. *Pyrethrum Myconis*, Drouet 176; Seubert 32.— Lowe, 457 (as *Myconia Chrysanthemum*).— Rchb. **16.** *pl. 95* (as *Coleostephus Myconis*).

Fayal (*Brown*, 146?, 147?, 148, 149). Pico. Terceira (449?). San Miguel (450?, 451?; *Carreiro*). Sta. Maria.

The specimens marked as questionable (*Plate 31*), are of the general appearance of this species, though the leaves are a little

too glaucous and serrate, and they possess its sterile rays and incurved achenia; but they appear to have the long erose corona limited to the rays, and the ripe achenia are quite destitute of the long corona shown, for example, by the specimens of *C. Myconis* in Schultz, Herb. Normale, no. 506, and by *Brown*, no. 149,— and generally held to characterize the species or even a genus which has been erected for it.

*C. SEGETUM, L. Watson 179, (2) 602; Drouet 176; Seubert 32; Seub. & Hochst. 13. — B. & H. 238. *f. 522.*

Corvo (454, 455). Flores (452). Fayal. Pico. Terceira (453; *Sampaio*). San Miguel. Sta. Maria (453, *a*).

C. CORONARIUM, L. Watson 179, (2) 602; Drouet 176; Seubert 32; Seub. & Hochst. 13.— Lowe, 459 (as *Pinardia coronaria*).— London Garden, 26: 440. *pl. 467.*

Fayal. Terceira (448). San Miguel.— Probably escaped.

*C. Parthenium, Bernh. Watson 180. *Pyrethrum Parthenium*, Watson (3) 382; Drouet 176.— B. & H. 238. *f. 523.*

San Miguel (*Carreiro*, 38).

C. PINNATIFIDUM, L. Watson 180, (2) 602, (3) 396; Drouet 176; Seubert 32; Seub. & Hochst. 13.— Lowe, 460 (as *Argyranthemum pinnatifidum*).

San Miguel.— An escape.

*Petasites fragrans, Presl.— Corbière, 338 (as *Nardosmia fragrans*).— Rchb. **16.** *pl. 895, 896.*

Fayal (*Brown*).

Doubtless the "*Petasites* ou un *Adenostyles*" reported from the Fayal caldeira by Drouet 179.— Presumably an escape, but prone to naturalization in favorable climates.

*SENECIO VULGARIS, L. Watson 181, (2) 602; Drouet 176; Seub. & Hochst. 13.— B. & H. 245. *f. 540.*

Fayal. Terceira (*Sampaio*). San Miguel.

*S. SYLVATICUS, L. Watson 181; Drouet 176.— B. & H. 246. *f. 542.*

Sta. Maria.— Not recently collected.

*S. ERRATICUS, Bertol. Watson 181, (3) 382; Drouet 176.— Willk. & Lange, Prodr. Fl. Hisp. **2**: 121.— Rchb. **16.** *pl. 73.*

San Miguel (*Carreiro*, at Serra Gorda).

*S. MALVAEFOLIUS, DC. Watson 182, (2) 602; Drouet 177; Seubert 32; Seub. & Hochst. 12. *S. Maderensis*, Watson (2) 602, (3) 391; Drouet 176.

Fayal. Terceira. San Miguel. *Sta. Maria.*

S. ELEGANS, L. Seub. &. Hochst. 13. *S. pseudo-elegans*, Watson 182, (2) 602, (3) 396; Drouet 176; Seubert 32.—Bot. Mag. 7. *pl. 238.*

Terceira (*Sampaio*). San Miguel.—A garden escape.

*S. mikanioides, Otto.—Lowe, 448.— *Plate 32.*

Fayal (*Brown*, 168). *Terceira* (Escaped, but now well established).

*CALENDULA ARVENSIS, L. Watson 183, (2) 603, (3) 396; Seub. & Hochst. 13; Drouet 177. —Lowe, 492.— Rchb. 15. *pl. 159.*

Fayal. Graciosa (456). Terceira. San Miguel. (*Carreiro*, 192). Sta. Maria (456, *a*).

C. OFFICINALIS, L. Watson 183, (2) 603, (3) 396; Drouet 177; Seubert 32.—Lowe, 491.—Bot. Mag. 59. *pl. 3204.*

Reported without locality by Seubert and Drouet, but at most, as in Madeira, a garden escape, and not evidently seen by recent collectors.

*†CARDUUS PYCNOCEPHALUS, L. Watson 177, (2) 602; Seub. & Hochst. 12. *C. tenuiflorus*, Drouet 177; Seubert 33.—Lowe, 501.—Rchb. 15. *pl. 134, 143.*

Pico. San Jorge (457). Graciosa (414, *a; Brown*, 150). San Miguel (*Carreiro*, 109). Sta. Maria (414, *b*).

*†CNICUS LANCEOLATUS, Willd. Seub. & Hochst. 12. *Cirsium lanceolatum*, Watson 177; Drouet 177; Seubert 33. *Carduus lanceolatus*, Watson (2) 602.—B. & H. 252. *f. 560.*

Fayal (*Brown*, 151). Pico.

*†GALACTITES TOMENTOSA, Moench. Watson 177, (2) 602; Drouet 177; Seubert 32; Seub. & Hochst. 12.—Lowe, 496.—Rchb. 15. *pl. 819.*

Fayal (*Brown*, 152, 153). Pico. Graciosa (458). Terceira (*Sampaio*). San Miguel (459, 460). Sta. Maria (460, *a*, 460, *b*).

*CENTAUREA MELITENSIS, L. Watson 177, (2) 602; Drouet 177; Seubert 32; Seub. & Hochst. 12.—Lowe, 508.—Rchb. 15. *pl. 796.*

Fayal. Pico. *Sta. Maria.*

*†CICHORIUM INTYBUS, L. Watson 183, (2) 600; Drouet 177; Seubert 33; Seub. & Hochst. 12.—B. & H. 271. *f. 607.*

Flores (461). Fayal (*Brown* 154, 155). *San Miguel.*—My impression is that I also saw it in Corvo.

***Tolpis nobilis**, Hochst. in Seubert 33. *pl. 11;* Watson 183, (2) 601; Drouet 178; Seub. & Hochst. 12.—Schultz, in Barker-Webb & Berth. Hist. Nat. Iles Can. **3.** 2^2: 399.

Corvo (473). Flores (463, agreeing closely with the type as figured, 464, toward the next variety, 465). Fayal. Pico. Terceira. San Miguel (466, 467, large leaved; 468, 469, 472, with narrowly elliptical reduced leaves).— *Plate 34.*

Leaves ovate or elliptical-ovate, sessile, the upper not greatly narrowed.

***T. nobilis, var. petiolaris**, n. var. *? T. macrorhiza*, Watson (2) 601, (3) 390; Drouet 177; Seubert 33.

Flores (470, 471, 475).

Slenderer than the type; leaves broadly elliptical or obovate, an inch and a half wide, acute at base, petioled; inflorescence more lax — *Plate 33.*

To my eye the same as *Crepis macrorhiza*, Lowe, Bot. Mag. n. s. 4. *pl. 2988*, which is kept up in Index Kewensis; but on the other hand not separable specifically from *T. nobilis*, which it very closely connects with the following species.

*T. FRUTICOSA, Schrank. Watson 184, (2) 600; Drouet 178; Seubert 33; Seub. & Hochst. 12.— Lowe, 525 (as *T. succulenta*).— *Plates 34–6.*

Corvo (476, 476, *a*, 477). Flores (478, 479, 481? 480 — with nearly entire leaves). Fayal. Terceira? Sta. Maria (481, *a* — a deeply pectinately-lobed form; 481, *b*, 481, *c*, 481, *d* — toward *T. nobilis;* chiefly with radical leaves simulating those of the last variety, and doubtfully placed here).

Leaves oblanceolate-spatulate, long-attenuate below, petioled, the uppermost becoming linear.

*T. BARBATA, Gaertn. Watson 185, (2) 600, (3) 395; Drouet 177; Seubert 33.— Rchb. **19**. *pl. 1359.*

Flores. Terceira. Sta. Maria.

*T. UMBELLATA, Bert. Watson 185, (2) 600; Drouet 177. *T. crinita*, Drouet 177; Seubert 33; Watson (2) 601, (3) 390; Seub. & Hochst. 12. — Lowe, 522.

Flores. Fayal. Terceira. San Miguel (474; *Carreiro*, 167).

*†PICRIS ECHIOIDES, L. *Helminthia echioides*, Watson 186, (2) 600; Drouet 179; Seubert 34; Seub. & Hochst. 12.— B. & H. 258. *f. 578.*

Flores (482, 483). Fayal. Graciosa (484). Terceira. San Miguel (*Carreiro*, 225). Sta. Maria (484, *a*).

* **P. rigens**, B. & H. Gen. Pl. **2**: 512. *Microderis rigens*, Watson 187, (2) 601, (3) 391; Drouet 178; Seubert 33. *Crepis rigens*, Dryander in Ait. Hort. Kew. **3**: 127. *Microderis umbellata*, Hochst. in Seubert 33. *pl. 12;* Seub. & Hochst. 12; Drouet 178. *Hypochaeris strigosa*, Solander.— Lowe, 537.

Flores (485, 486, 487). Fayal. Pico. San Miguel (488; *Carreiro*).

*P. filii, B. & H. Gen. Pl. **2**: 512. *Microderis filii*, Hochst. in Seubert 34. *pl. 13;* Watson 188, (2) 601; Drouet 178; Seub. & Hochst. 12.

Flores. Fayal (*Brown* 158). Terceira (489). San Miguel (491).

*CREPIS VIRENS, L. Watson 187; Drouet 179. *C. polymorpha*, Drouet 179; Seubert 34; Watson (2) 600; Seub. & Hochst. 12. *C. diffusa*, Drouet 179.— B. & H. 266. *f. 596.*

Flores. Fayal (*Brown*, 160, 161, 162). San Jorge (492). Graciosa (493, 494). Terceira (495). San Miguel.

*HYPOCHAERIS GLABRA, L. Watson 186, (2) 600; Drouet 178; Seubert 33; Seub. & Hochst. 12.— B. & H. 261. *f. 583.*

Flores. Fayal. San Miguel.— Not recently collected.

In aspect somewhat resembling the next, but with chaff between the flowers, and other technical differences.

*LEONTODON HIRTUS, L. *Thrincia hirta*, Watson 185, (3) 382; Drouet 178.—Corbière 370.—*Plates 37–8.*

Flores. Fayal (*Brown*, 159, 163). San Jorge (490). Graciosa (498, 500). Terceira (501, 502). San Miguel (496?, 497, 499; *? Carreiro*). Sta. Maria (499, *a*, 499, *b*?, 499, *c*?, 499, *d*).

*L. NUDICAULIS, B. & H. Gen. Pl. **2**: 521. *Thrincia nudicaulis*, Watson 185, (2) 600, (3) 390; Drouet 178; Seubert 33. *pl. 12;* Seub. & Hochst. 12.—Lowe, 532 (under *T. hispida*).

Fayal. San Miguel.

My nos. 496, 499,*b*, 499,*c*, and Dr. Carreiro's specimen, all referred doubtfully to the preceding species, are the only specimens seen by me which have the elongated tap root of the present species, and they scarcely have the very long achenial beak shown by Seuberts' figure. In Index Kewensis, *T. nudicaulis* is placed under *L. saxatilis*.

*†TARAXACUM OFFICINALE, Weber. Watson 186. *Leontodon Taraxacum*, Drouet 178; Watson (2) 600.—B. & H. 265. *f. 593* (as *T. Dens-Leonis*).

Fayal (*Brown*, 164). Graciosa (503). Terceira (504). San Miguel (*Carreiro*, 2, 186).

*LACTUCA SCARIOLA, L. Watson 186, (2) 600; Drouet 178.—B. & H. 262. *f. 587.*

Flores. Fayal.—Not recently collected.

***L. Watsoniana**, n. sp.

Fayal? Pico (*Brown*, 165, *a*).

Tall: leaves large, the lowest 15 × 30 cm., not lobed, sinuate-dentate, densely pruinose especially beneath, the lowest obtuse, abruptly contracted into a winged petiole, the upper acute, ovate-lanceolate, sessile, sagittately clasping: panicle corymbose: heads numerous, 12 to 15 mm. long: achenes (immature) short-beaked.—*Plate 39.*

Not identifiable with any described species, and, though immature, appearing to warrant publication as a nondescript. Dedicated to Mr. Hewett C. Watson, since it appears to be the large leaved Composite noted by him in Hook. London Journ. Bot. **3**: 615 and Godman's Azores, 187, and subsequently found by Drouet (p. 178) in the Fayal caldeira.

*†SONCHUS OLERACEUS, L. Watson 187, (2) 600; Drouet 179; Seub. & Hochst. 12.—B. & H. 264. *f. 592.*

Corvo (511; 513). Flores (505, 509, 512). Fayal. Pico (*Brown*, 165). Graciosa (508, 514, 516). Terceira. San Miguel (507; *Brown*, 166; *Carreiro*). Sta. Maria (507, *a*).

*†S. ASPER, Hill. Watson 187. *S. fallax*, Drouet 179; Seubert 34; Watson (2) 600.— B. & H. 264.— Rchb. **19**. *pl. 1410, 1411.*

Corvo (510). Fayal. Pico. (*Brown*, 167). San Miguel (506, 506, *a*?, 515?).

*UROSPERMUM PICROIDES, Schm. Watson 186, (2) 600; Drouet 178; Seubert 33; Seub. & Hochst. 12.— Lowe, 536.— Rchb. **19**. *pl. 26.*

Fayal. San Miguel.— Not recently collected.

LOBELIACEAE.

*LOBELIA URENS, L.— B. & H. 273. *f. 611.*

Terceira (523,— in the highlands toward the water-sources of Angra).

L. ERINUS, L.— Bot. Mag. **23**. *pl. 901.*

San Miguel (*Dr. C. Rodrigues*, at Villa Franca).— A garden escape, rather of the *L. bicolor* form than the type.

CAMPANULACEAE.

*Trachelium caeruleum, L. — Lowe, 579. — Bot. Reg. 1. *pl. 72.*

Fayal (*Brown*). Terceira (406, 407, 408).

Becoming well established, as in Madeira.

***Campanula Vidalii,** Watson in Hooker's Icones, 7. *pl. 684.* (4) 188, (2) 594, (3) 388; Drouet 178.

Flores (517, 518, 519, 520).

On cliffs and detritus by the sea-shore, and on outlying rocks, around the entire island,— my collections from Santa Cruz, near the Custom House, Ribeira da Cruz, Fazazinha, and Fazam Grande, and the plant seen at other points. Mr. Watson also reports it as having been collected many years ago on Santa Maria and San Miguel; but the impression there and on Terceira is that it occurs in cultivation only and was originally derived from Flores.

*C. ERINUS, L. Watson 191, (2) 594; Drouet 179; Seubert 34; Lowe, 573. *Wahlenbergia Erinus*, Seub. & Hochst. 12.—Rchb. **19.** *pl. 1607.*

Flores. Fayal. Terceira (521, 522). San Miguel (*Carreiro*).

VACCINIACEAE.

***Vaccinium cylindraceum**, Smith in Rees' Cyclop. **36**; Watson 191, (2) 595, (3) 395; Drouet 189; Seubert 41. *V. Maderense*, Drouet 189; Seubert 41; Watson (1) 7, 129, 399, 407, (2) 595, (3) 395. *V. longiflorum*, Seubert 41; Watson (3) 395; Drouet 189. *V. padifolium*. Seub. & Hochst. 12.— *Plate 40.*

Flores (524). Fayal (*Brown*, 121). Pico (*Brown*, 122). Terceira (525, 526). San Miguel (527, 528, 529; *Carreiro*). Sta. Maria (529, *a*, 529, *b*).

ERICACEAE.

*CALLUNA VULGARIS, Salisb. Watson 193, (1) 405, (2) 595; Drouet 189; Seubert 40. *Erica vulgaris*, Seub. & Hochst. 12.— B. & H. 286. *f. 640.*

Flores (532). Fayal (*Brown*, 123, 124, 125). Pico. Terceira (533; *Sampaio*). San Miguel (530, 531, 534; *Brown*, 126; *Carreiro*). Sta. Maria (534, *a*).

***Erica Azorica**, Hochst. in Seubert 40; Seub. & Hochst. 12; Watson 194, (2) 594; Drouet 188. *E. scoparia*, Watson (1) 399, 405, (2) 594.

Corvo (535). Flores (536, 537). Fayal (*Brown*, 127). Pico (*Brown*, 128). Graciosa (538). Terciera. San Miguel (539; *Brown*, 129; *Carreiro*). Sta. Maria (539, *a*).

Two states *a. chlorantha*, and *β. erythrantha*, are characterized by Hochstetter, on the color of the flowers.

E. SCOPARIA, L. Watson 194, 221; Drouet 189; Seubert 40. *E. fucata*, Seub. & Hochst. 12.— Lowe, 2: 5.— Rchb. **17.** *pl. 1164.*

San Miguel, on the island off Villa Franca, according to Seuber, and Drouet, but regarded with some doubt by Mr. Watson, and probably merely a form of the preceding.

*Daboecia polifolia, Don. Drouet 189; Seubert 40. *Menziesia polifolia*, Watson 193, (1) 7. *Menziesia Daboeci*, Watson (2) 595. *M. Daboeze*, Seub. & Hochst. 12.—B. & H. 283. *f. 633.*

Flores. Fayal (*Brown*, 130, 131). Pico. Terceira.

Plumbaginaceae.

*Statice Limonium, L. Watson 215, (3) 382; Drouet 190. *S. serotina*, Drouet 190.—B. & H. 364. *f. 821.*

Pico. Terceira. San Miguel (540; *Brown*, 170; *Carreiro*, 25). Sta. Maria (540, *a*).

Primulaceae.

***Lysimachia Azorica**, Hornem. in Bot. Mag. *pl. 3273;* Watson 211, (1) 407, (2) 599, (3) 389; Phytologist 2: 766, 975; Drouet 188; Seub. & Hochst. 11. *L. nemorum*, Drouet 188; Seubert 39. *L. Hochstetteri*, Steud. Nomenclator. 2 ed. 2: 84.

Corvo (541, 542, 543). Flores (544, 545, 546). Fayal (*Brown*, 171). Pico (*Brown*, 172). Terceira (547, 548). San Miguel (549, 550, 551; *Brown*, 173, 174; *Carreiro*). Sta. Maria.

I follow Mr. Watson in keeping this apart from *L. nemorum*, with which the Index Kewensis unites it.

*Anagallis arvensis, L. Watson 212, (2) 599; Drouet 188; Seubert 40. *A. Phoenicia*, Drouet 188; Seub. & Hochst. 11.— B. & H. 294. *f. 658.*

Flores (553). Fayal (*Brown*, 175). Pico. Graciosa (554, 555). San Miguel (556, 557). Sta. Maria (557, *a*).

*A. caerulea, Lam. Watson 212, (2) 599; Drouet 188; Seub. & Hochst. 11.— Lowe, 2: 36.—Rchb. 17. *pl. 41* (under *A. arvensis*, with which it is commonly united).

Fayal. San Miguel (*Carreiro*, 98). Sta. Maria (557, *b*).

*A. TENELLA, L. Watson 212; Drouet 188.—B. & H. 294. *f. 659.*

Flores (558, at the Caldeira da Lomba). Pico. Sta. Maria.

*CENTUNCULUS MINIMUS, L. Watson 213, (2) 599; Drouet 188.— B. & H. 294. *f. 660.*

Corvo. Flores.— Not recently collected.

*SAMOLUS VALERANDI, L. Watson 213, (2) 600; Drouet 188.— B. & H. 295. *f. 661.*

Flores (559, 560, 561).

MYRSINACEAE.

*MYRSINE AFRICANA, L. var. RETUSA, DC. Watson 210; Seubert 40. *M. retusa*, Ait. Hort. Kew. **1**: 271; Drouet 188; Watson (2) 600; Seub. & Hochst. 12.— Loddiges, Bot. Cab. **5**. *pl. 409.*

Corvo (59). Flores (60, 61, 62). Fayal. Pico (*Brown*, 176). Terceira (63). San Miguel (64, 65; *Carreiro*). Sta. Maria (65, *a*).

OLEACEAE.

JASMINUM AZORICUM, L. Sp. Pl. 7; Drouet 180; Seubert 35; Commelyn, Hort. **1**: 159; Watson (2) 595.

Originally ascribed to the Azores but apparently by error.

*NOTELAEA EXCELSA, Webb. *Picconia excelsa*, Watson 194; Drouet 180; Seubert 35. *Olea excelsa*, Watson (2) 595; Seub. & Hochst. 12.—Lowe, **2**: 23.—Barker-Webb & Berthel. Hist. Nat. Iles. Canar. *pl. 186.*

Corvo (562). Flores (563, 564). Fayal. Pico. San Miguel (565, 566). Sta. Maria (566, *b*).

FRAXINUS PARVIFOLIA, Lam.— Dippel, Handb. Laubholzkunde. **1**: 94. *f. 51.*

Flores (566, *a*).— Brought to me as wild, but doubtless originally planted.

APOCYNACEAE.

*VINCA DIFFORMIS, Pour. *V. media*, Watson 194; Drouet 181. *V. major*, Watson (3) 382.— Willk. & Lange, Prodr. Fl. Hisp. **2**: 665.— Rchb. **17**. *pl. 1063.*

Flores. Fayal (*Brown*, 177, 178). Terceira (567). San Miguel (568; *Brown* 179).

Asclepiadaceae.

Gomphocarpus fruticosus, R. Br. Drouet 181; Seubert 35. *Asclepias fruticosa*, Watson 194, (1) 7, (2) 595; Seub. & Hochst. 12.— Lowe, 2: 47.— Bot. Mag. 39. *pl. 1628*.

Fayal.— Said to be merely an escape there, but thoroughly established in Madeira.

Gentianaceae.

*Microcala filiformis, Hoffmg. & Lk. *Exacum filiforme*, Watson 196, (2) 595; Drouet 181; Seubert 36; Seub. & Hochst. 12. *Cicendia filiformis*, Watson (3) 395.— B. & H. 301. *f. 672*.

Terceira. San Miguel.— Not recently collected.

*Erythraea Centaurium, Pers. Watson 195, (2) 595, (3) 395; Drouet 180; Seub. & Hochst. 12. *E. latifolia*, Seubert 36; Watson (3) 395; Drouet 181. *E. pulchella*, Drouet 181.— B. & H. 301. *f. 674*.

Corvo. Flores (569, 570, 571, 572, 573). Fayal (*Brown*, 191, 206, 207). Pico (*Brown*, 208). Terceira (574, 575). San Miguel (576, 577; *Brown*, 192; *Carreiro*, 134, 161, 177). Sta. Maria (577, *a*, 577, *b*).

*E. Massoni, Sweet. Watson 195, (2) 595, (3) 388. Drouet 181. *E. diffusa*, Drouet 181; Seubert 36; Watson (1) 408; Seub. & Hochst. 12. — Corbière, 394 (as *E. scilloides*). *Chironia maritima*, Ait. Hort. Kew. 2 ed. 2: 6. *Gentiana scilloides*, Seub. & Hochst. 12.— Le Jolis, Ann. Sci. Nat. Bot. iii. 7: 217. *pl. 13*.

Corvo (578, 579, 580). Flores (581, 582). Fayal (*Brown*, 189). Pico. Terceira (583, 584, 585). San Miguel (586, 587, 588, 589, 590; *Brown*, 190; *Carreiro*). Sta. Maria (590, *a*, 590, *b*).

The nomenclature discussed at length by Le Jolis, Mem. Soc. Cherbourg, 1896, and Malinvaud, Bull. Soc. Bot. de France, 43: 423.

*E. MARITIMA, Pers. Drouet 181. *E. lutea*, Watson 196, (3) 382; Drouet 181.— Lowe, **2**: 41.— Rchb. **17**. *pl. 20.*

Fayal. Pico. San Miguel (591, 592; *Carreiro*, 179). Sta. Maria.

BORAGINACEAE.

*†HELIOTROPIUM EUROPAEUM, L. Watson 210, (1) 397, (2) 596; Drouet 184; Seubert 37; Seub. & Hochst. 12.— Gray, 361.— Rchb. **18**. *pl. 1294.*

Pico (*Brown* 210). San Jorge (597). Graciosa. Terceira (598).

*†CYNOGLOSSUM PICTUM, Sol. Watson 210, (3) 382; Drouet 184.— Willk. & Lange, Prodr. Fl. Hisp. **2**: 508.— Rchb. **18**. *pl. 1331.*

Flores. Graciosa (599). Terceira. San Miguel (*Carreiro*). Sta. Maria (599, *a*).

***Myosotis maritima,** Hochst. in Seubert 37; Watson 209, (1) 408, (2) 597, (3) 388; Drouet 185; Seub. & Hochst. 12.— *Plate 41.*

Corvo (600— in a seaside ravine among the high cliffs west of Rosario, 601 — under the sea cliffs south of the town). Fayal. Pico.

I should refer my specimens to the next species were it not for the pale color, large size, and rounded, not cordate, segments of the corolla.

***M. Azorica,** Watson, Bot. Mag. **70**. *pl. 4122*, (2) 597, (3) 388, (4) 209; Drouet 185.

Corvo. Flores.

*M. COLLINA, Hoffm. *M. arvensis*, Watson 210, (3) 382; Drouet 185.— B. & H. 313. *f. 700.*

San Miguel (*Carreiro*, 129, 151).

M. STRICTA, Lk. Watson 210, (2) 597, (3) 395; Drouet 185; Seubert 37; Seub. & Hochst. 12.— Rchb. **18**. *pl. 1324.*

Indefinitely reported by Seubert, and likely to be either the preceding or the following.

*M. VERSICOLOR, Sm. Watson 210, (2) 597; Drouet 185; Seubert 37.— B. & H. 313. *f. 701.*

San Miguel, Sta. Maria.

*†ECHIUM VIOLACEUM, L. Watson 210, (2) 597; Drouet 184; Seubert 37.— Rchb. **18.** *pl. 99.*

Flores (603). Terceira. San Miguel (602; *Brown*, 211; *Carreiro*, 218). Sta. Maria (603,*a*, 603,*b* — an albino).

E. VULGARE, L. Watson 210, (2) 597; Drouet 185; Seubert 37; Seub. & Hochst. 12.— B. & H. 307. *f. 690.*

San Miguel.— Doubtful.

SYMPHYTUM ASPERRIMUM, Donn.— Bot. Mag. **24.** *pl. 929.*

Terceira (*Sampaio*). San Miguel (604 — escaping from cultivation).

CONVOLVULACEAE.

*Ipomoea carnosa, R. Br. *Batatas littoralis*, Watson 197. *Convolvulus Imperati*, Drouet 185; Watson (2) 596. *C. Soldanella*, Drouet 185; Seubert 38.— *Plate 42.*

Fayal (*Brown*, 183, at Porto Pym).

*†CALYSTEGIA SEPIUM, R. Br. *Convolvulus sepium*, Watson 197, (2) 596; Drouet 185; Seubert 38; Seub. & Hochst. 12.— B. & H. 306. *f. 685.*

Corvo (606). Flores (607, 608). Fayal (*Brown*, 180, 181).

Seubert, *l. c.* publishes also a variety *roseomaculata*, Hochst.

*†CONVOLVULUS ARVENSIS, L. Watson 196, (2) 596; Drouet 185; Seubert 38; Seub. & Hochst. 12.— B. & H. 306. *f. 684.*

Flores (609, 613). Fayal. Graciosa (610, 611, 612). *Terceira*. San Miguel (*Brown*, 182). Sta. Maria (612, *a*).

Pure white flowers, and also a form with rosy variegation.

SOLANACEAE.

*†SOLANUM PSEUDOCAPSICUM, L. Watson 198, (2) 598; Drouet 186; Seubert 38; Seub. & Hochst. 12.— Lowe, **2**: 79.— *Plate 43.*

Flores (615). Fayal. Pico. *San Jorge*. Terceira (614). San Miguel.

*†S. NIGRUM, L. Watson 198, (2) 598; Drouet 186; Seubert 38; Seub. & Hochst. 12.— B. & H. 319. *f. 714.*

Corvo (617, 619). Flores. Fayal (*Brown*, 184, 185). Pico. San Jorge (621). Graciosa (616, 618, 620). Terceira (*Sampaio*). San Miguel (*Brown*, 193; *Carreiro*). Sta. Maria (621, *a*).

*†S. NIGRUM, var. VILLOSUM, L. *S. villosum*, Watson 198, (2) 598; Drouet 186.—Lowe, **2**: 76.—Hayne, Arzneigew. **2**. *pl. 41*.

Corvo (622, 623, 624).—A series of villous to tomentose forms, variously intermediate between the species and this variety.

S. AURICULATUM, Ait — Lowe, **2**: 80.— L'Her. Sert. Angl. *pl. 114*.

Terceira (626, near the sources of the Angra water supply).—Escaping from cultivation, as in Madeira.

*Physalis Peruviana, L. *P. pubescens*, Watson 198, (2) 598; Drouet 186; Seubert 38; Seub. & Hochst. 12.— Lowe, **2**: 90.— *Plate 44*.

Corvo. Flores (629). Fayal (*Brown*, 186). San Jorge (627). Graciosa (628, 630). *Terceira*. *San Miguel*. *Sta. Maria*.

LYCOPERSICUM ESCULENTUM, Dun. Seubert 38; Watson (2) 598, (3) 395; Drouet 186. *Solanum Lycopersicum*, Seub. & Hochst. 12.— Lowe, **2**: 84.— Rchb. **20**. *pl. 1634*.

Terceira.— Scarcely established.

*HYOSCYAMUS ALBUS, L. Watson 199. *H. Canariensis*, Drouet 185; Seubert 38; Watson (1) 396, (2) 598, (3) 389; Seub. & Hochst. 12.— Lowe, **2**: 111.— Rchb. **20**. *pl. 1623*.

Flores. Fayal (*Brown*, 187). Pico. Graciosa. Terceira (631). San Miguel (*Carreiro*). Sta. Maria (631, *a*).

*†DATURA STRAMONIUM, L. Watson 199; Drouet 184; Seub. & Hochst. 12; Seubert 38.— B. & H. 318. *f. 711*.

Fayal (observed by Mr. Brown). San Miguel.

SCROPHULARIACEAE.

*†VERBASCUM VIRGATUM, Stokes. Watson 199, (3) 382; Drouet 186.—B. & H. 326. *f. 726*.

Flores (633). Terceira. San Miguel (632). Sta. Maria.

V. BLATTARIA, L. Watson, 199; Drouet 186.— B. & H. 326. *f. 725.*

Pico.— Perhaps refers to the preceding.

*†V. THAPSUS, L. Watson 200, (2) 598; Drouet 186.— B. & H. 325. *f. 724.*

Fayal (*Brown, f.*).

*†× V. SPURIUM, Koch. Watson 199; Drouet 186. — Corbière, 417.— Rchb. **20.** *pl. 1661, 1670* (as *V. Thapso-Lychnitis*).

Pico (*Brown, h.*) San Jorge. Terceira (634). San Miguel.

If correctly named, this hybrid appears to have been introduced into the Azores as such, since *V. Lychnitis* has not been observed there, and *V. Thapsus*, so far as I know, was not collected before 1894;— but there is no great difficulty in believing this to be the case.

*LINARIA SPURIA, Mill. Watson 202, (2) 599; Drouet 186; Seubert 38; Seub. & Hochst. 11.— B. & H. 330. *f. 738.*

Corvo (635, 636). Flores (637). Fayal. Pico (*Brown*, 194). Terceira. San Miguel. Sta. Maria (637, *a*).

*L. ELATINE, Mill. Watson 203; Drouet 186; Seub. & Hochst. 11. *L. cirrhosa*, Watson 203, (2) 599, (3) 395; Drouet 186; Seubert 38; Seub. & Hochst. 11. *L. dealbata*, Watson (2) 599. *L. Sieberi*, Seubert 38; Watson (3) 395. *L. Graeca*, Watson (3) 395.— B. & H. 330. *f. 739.*

Fayal. Terceira (638, *a*, 639, *a*). San Miguel (640, *a*, 641, *a* — with the reduced upper leaves less hastate than usual, 642, *a*; *Carreiro*, 43, 217).

L. CYMBALARIA, Mill.— B. & H. 329. *f. 737.*

Fayal (*Brown*, 195).—Doubtless escaped.

*ANTIRRHINUM ORONTIUM, L. Watson 202, (2) 599; Drouet 187; Seubert 38; Seub. & Hochst. 11.— B. & H. 327. *f. 731.*

Corvo (638). Flores (639). Fayal. Pico (*Brown*, 197). San Jorge (640). Terceira (641; *Sampaio*). San Miguel (642; *Carreiro*, 12). Sta. Maria (642, *a*).

*Scrophularia Scorodonia, L. Watson 202, (2) 599; Drouet 186; Seubert 38; Seub. & Hochst. 11.— B. & H. 331. *f. 742.*

Terceira (643). San Miguel (644, 645; *Brown*, 199).

*S. alata, Gilib.— Rchb. **20.** *pl. 1672.*

San Miguel (646, near the Furnas; *Brown*, 198).

Perhaps only an exceptionally winged form of the next.

*S. aquatica, L. Drouet 186; Watson (2) 599. *S. Balbisii*, Watson 202.— B. & H. 331. *f. 741;* Rchb. **20.** *pl. 1673.*

Flores (647, 648, 649, 650).

*Mimulus moschatus, Dougl.—Gray, Syn. Fl. **2**[1]**: 1:** 278.— Bot. Reg. **13.** *pl. 1118.*

San Miguel (681, in the deep ravine above Lagoa das Furnas; *Brown*, 205).

Unquestionably a garden escape, but well established.

*Sibthorpia Europaea, L. Watson 203, (2) 598, (3) 389; Drouet 187; Seubert 39. *Disandra Africana*, Seub. & Hochst. 11.— B. & H. 332. *f. 746.*

Corvo (652). Flores (653, 654, 655, 656). Fayal. Pico. Terceira (659). San Miguel (657, 658; *Brown*, 200). Sta. Maria (659, *a*, 659, *b*).

*Digitalis purpurea, L. Watson 204; Drouet 186.— B. & H. 333. *f. 747.*

Terceira.

Found only by Morelet and Hartung, and perhaps only an escape, though one of the commonest plants at suitable altitudes in Madeira.

*Veronica Anagallis, L. Watson 200, (2) 599; Drouet 186; Seubert 39.— B. & H. 336. *f. 753.*

Flores (660). Fayal (*Brown*, 201). Terceira (661). San Miguel (*Brown*, 202). Sta. Maria (661, *a*).— Not always glabrous.

***V. Dabneyi,** Hochst. in Seubert 39. *pl. 8;* Watson 200, (2) 599; Drouet 186; Seub. & Hochst. 11.

Corvo. Fayal. San Miguel. — Not recently collected.

*V. TOURNEFORTII, Gmel.—Corbière, 434; B. & H. 337. *f. 760* (as *V. Buxbaumii*).— Rchb. **20**. *pl. 1699* (as *V. Persica*).

San Miguel (*Carreiro*, 116).

*†V. OFFICINALIS, L. Watson 201, (2) 599; Drouet 187; Seubert 39; Seub. & Hochst. 11.— B. & H. 335. *f. 752*.

Fayal. Pico. Terceira (662, 663, 664). San Miguel (665, 666; *Brown*, 204).

*†V. SERPYLLIFOLIA, L. Watson 201, (2) 599; Drouet 187.— B. & H. 335. *f. 751*.

Corvo (673). Flores (674). Fayal. Pico (*Brown*, 203). Terceira (675). San Miguel (552, 676, 677).

*†V. AGRESTIS, L.— B. & H. 337. *f. 759*.

Corvo (668). Terceira (*Sampaio*). San Miguel (672). Sta. Maria (672, *a*).

*†V. ARVENSIS, L. Watson 201, (2) 599; Drouet 187; Seubert 39; Seub. & Hochst. 11.— B. & H. 338. *f. 761*.

Flores (667). Fayal (*Brown*, *e*). Terceira (669, 670). San Miguel (671, 672; *Carreiro*, 148).

***Euphrasia grandiflora**, Hochst. in Seubert 39. *pl. 8*; Seub. & Hochst. 11; Watson 201; Drouet 187. *E. Azorica*, Watson Lond. Journ. Bot. **3**: 598, (4) 201; Drouet 187. *?E. officinalis*, Watson 201, (2) 598, (3) 395; Drouet 187; Seubert 39.

Corvo. Flores (678, 679). Fayal. Pico (*Hochstetter*, 54). Terceira.

*BARTSIA TRIXAGO, L. Watson 202, (2) 598; Drouet 187; Seubert 39.— Rchb. **20**. *pl. 1724*.

Pico. San Miguel. Sta. Maria.

*B. VISCOSA, L. Watson 202.— B. & H. 339. *f. 765*.

Terceira.

OROBANCHACEAE.

*OROBANCHE SPECIOSA, DC. ?.— Wilkomm & Lange, Prodr. Fl. Hispan. **2**: 622.— Rchb. **20**. *pl. 161*.

San Miguel (*Chaves*.— Parasitic on beans, and attaining an unusually large size).

ACANTHACEAE.

*ACANTHUS MOLLIS, L. Watson 199, (2) 599; Drouet 188.— Rchb. **20.** *pl. 1811.*

Flores. Fayal. San Miguel.— Not recently collected.

VERBENACEAE.

*†VERBENA OFFICINALIS, L. Watson 205,(2) 599; Drouet 184; Seubert 37; Seub. & Hochst. 11.— B. & H. 363. *f. 820.*

Corvo (681). Flores (682). Fayal (*Brown*, 212, 213, 214). Pico. Graciosa (683). Terceira (684). San Miguel (685; *Carreiro*, 159). Sta. Maria (685, *a*).

V. BONARIENSIS, L.— Dillenius, Hort. Elth. *pl. 300.*

Fayal (*Brown*, 215). San Miguel (687; *Carreiro*, 8).— Escaped, but seemingly well established.

LABIATAE.

LAVANDULA STOECHAS, L. Drouet 182; Seubert 36; Watson (1) 7, (2) 598.— Nouv. Duhamel, **3.** *pl. 43.*

Fayal.— Escaped. Not recently seen.

*MENTHA ROTUNDIFOLIA, Huds. Watson 205, (2) 597; Drouet 182; Seubert 36; Seub. & Hochst. 11.— B. & H. 347. *f. 779.*

Flores (688). Fayal (*Brown*, 221, 222). Terceira (689). San Miguel (690; *Carreiro*, 77, *b*).

*M. AQUATICA, L. Watson 206, (2) 597; Drouet 182.— B. & H. 347. *f. 782.*

Flores (699, 700, 701, 702). Fayal (*Brown*, *a*). Pico (*Brown*, *b*). San Miguel (703, 704, 705, 706; *Brown*, *c*; *Carreiro*, 920).

Nos. 699, 700, 705, and 706, come nearest to the usual form of *M. aquatica*; the others have a longer, narrower and more interrupted spike. 704 somewhat resembles *M. viridis*.

M. VIRIDIS, L. Watson, 205, (2) 597; Drouet 182; Seubert 36; Seub. & Hochst. 11.— B. & H. 347. *f. 780.*

Flores. Sta. Maria.— Regarded with doubt by Mr. Watson.

M. PIPERITA, Sm. Watson, 205; Drouet 182.— B. & H. 347. *f. 781.*

Sta. Maria.— Regarded as doubtful by Mr. Watson.

*M. PIPERITA, var. CALVIFOLIA, Briquet, Bull. Boissier Herb. **2**: 703.

San Miguel.

M. SATIVA, L. Watson 205, (2) 597; Drouet 182.– B. & H. 348. *f. 783.*

Flores. Fayal. San Miguel.— Questionable.

*M. PULEGIUM, L. Watson 206, (2) 597; Drouet 182.— B. & H. 348. *f. 785.*

Corvo. Flores (691, 692, 693, 694). Fayal (*Brown*, 218). Pico (*Brown*, 219). Graciosa (695). Terceira (696). San Miguel (697, 698; *Brown*, 220; *Carreiro*).

*LYCOPUS EUROPAEUS, L. Watson 206, (3) 382; Drouet 182.— B. & H. 346. *f. 777.*

Pico (*Brown*, 225). Terceira. San Miguel (707, 708; *Brown*, 226).

*THYMUS SERPYLLUM, L. var. ANGUSTIFOLIUS, Boiss. *T. angustifolius*, Watson 206; *T. Micans*, Drouet 183; Seubert 36; Watson (2) 597; Seub. & Hochst. 11. *T. Azoricus*, Loddiges, Bot. Cab. **16**. *pl. 1530*. *T. caespitosus*, Watson (1) 6. *T. caespititius*, Watson (1) 130, 403, 405.— Corbière, 467.— Rchb. **18**. *pl. 1265.*

Corvo (710, 711). Flores (712, 713). Fayal (*Brown*, 224). Pico. Terceira (709, 714). San Miguel (715; *Carreiro*, 216). Sta. Maria.

*ORIGANUM VIRENS, Hoffmg. & Lk. Watson 207, (2) 598, (3) 395; Drouet 182. *O. Creticum*, Seubert 36; Watson (2) 598, (3) 395; Seub. & Hochst. 11; Drouet 182. *O. vulgare*, Drouet 182.—Willk. & Lange, Prodr. Fl. Hisp. **2**: 398.— Rchb. **18**. *pl. 1263.*

Flores (716, 717). Pico (*Brown*, 227, 228). San Jorge (*Brown*, 229). Terceira. San Miguel (718; *Carreiro*, 158). Sta. Maria (718, *a*).

O. MARJORANA, L. Watson 207; Drouet 183.— Hayne, Arzneigew. **8**. *pl. 9.*

Pico.— Probably escaped.

*MELISSA OFFICINALIS, L. Watson (2) 598; Drouet 183.— Corbière, 464.— Rchb. **18**. *pl. 1261.*

Flores (743). Pico (*Brown*, 229, *a*). Terceira (*Sampaio*).— Escaped, but seemingly naturalized.

*Calamintha officinalis, Moench. Watson 207, (2) 597. *C. Nepeta*, β. *rotundifolia*, Drouet 183. *Melissa Calamintha*, β. *villosissima*, Drouet 183; Seubert 37. *M. rotundifolia*, Seub. & Hochst. 11.— B. & H. 351. *f. 789.*— Rchb. **18**. *pl. 1278.*

Corvo (719). Flores (720). Fayal (*Brown*, 231). Pico (*Brown*, 232). Graciosa. Terceira (721). San Miguel (722, 723; *Brown*, 233; *Carreiro*, 206).

All of my specimens are puzzling, having the small firm-looking leaves of what usually passes for *C. Nepeta*, with the larger longer-pedicelled flowers of true *officinalis*, while the peduncles are intermediate between the two. By M. Christ, the San Miguel plant has been named *C. Nepeta*, and at Coimbra it has been called *C. Baetica*. A Madeiran form, quite the same, was distributed among Wright's 1853 collections as *C. officinalis*.

*C. Clinopodium, Benth. Watson 207. *Clinopodium vulgare*, Drouet 183; Watson (2) 597.— B. & H. 351. *f. 790.*

Flores (724). San Miguel (725). Sta. Maria (725, *a*, — an albino, as was Watson's Flores plant).

Differs from the usual *Clinopodium* of the two continents in its shorter nodes and short deltoid-ovate leaves, tinged with purple, like the stem. The calyx is quite short and its teeth are rigid.

Rosmarinus officinalis, L. Drouet 182; Seubert 36; Watson (1) 7, (2) 598.— Hayne, Arzneig. 7. *pl. 25.*

Fayal. San Miguel.— Escaping.

*†Nepeta Glechoma, Benth. Watson 208. *Glechoma hederacea*, Drouet 183.— B. & H. 352. *f. 791.*

San Miguel (*Carreiro*, 82).

Cedronella triphylla, Moench. Watson (3) 383; Drouet 183.— Zorn, Icon. Pl. Medicin. 5. *pl. 423.*

San Miguel.— Escaped, and not recently collected.

*Prunella vulgaris, L. Watson 208, (2) 598; Drouet 184; Seubert 37; Seub. & Hochst. 11.— B. & H. 352. *f. 793.*

Corvo. Flores (738, 739, 740). Fayal (*Brown*, 230). Pico. Terceira (741). San Miguel (742; *Carreiro*, 160). Sta. Maria (742, *a*).

*†Marrubium vulgare, L. Watson 208, (3) 382; Drouet 184.— B. & H. 354. *f. 797.*

Pico (*Brown*, 234). Graciosa (734, 735; *Brown*, 235). Terceira (736; *Sampaio*). San Miguel (737; *Carreiro*). Sta. Maria (737, *a*).

*Stachys arvensis, L. Watson 208, (2) 598; Drouet 184; Seubert 37; Seub. & Hochst. 11. — B. & H. 356. *f. 802.*

Corvo (726, 727). Flores (733). Fayal. San Jorge (728, 732). Graciosa (729, 730). Terceira (*Sampaio*). San Miguel (731; *Carreiro*). Sta. Maria (731, *a*).

*Lamium purpureum, L. Watson 208; Drouet 183.— B. & H. 359. *f. 809.*

San Miguel.— Not recently collected.

*L. amplexicaule, L. Watson 208, (3) 382; Drouet 183.— B. & H. 359. *f. 808.*

San Miguel.

*Ballota nigra, L. Watson 208, (3) 382; Drouet 184.— B. & H. 358. *f. 806.*

San Miguel.— Not recently collected.

Plantaginaceae.

*†Plantago major, L. Watson 213, (2) 603; Drouet 190; Seubert 30; Seub. & Hochst. 11; ?*P. media*, Watson 213, (2) 603, (3) 396; Drouet 190; Seubert 30; Seub. & Hochst. 11.— B. & H. 366. *f. 826.*

Corvo (744). Flores (745). Fayal. Graciosa. Terceira (746). San Miguel (*Carreiro*).

*†P. lanceolata, L. Watson 214, (2) 603; Drouet 190; Seubert 30; Seub. & Hochst. 11.— B. & H. 367. *f. 828.*

Flores (762, 764, 768). Fayal (*Brown*, 216). Graciosa (763). Terceira (*Sampaio*).

None of these specimens quite typical, but scarcely pertaining to the next variety.

*P. LANCEOLATA, var. ERIOPHYLLA, Barker-Webb & Berth. *P. lanceolota*, Watson 214, in part. *P. Azorica*, Hochst. in Seubert 30. *pl. 7;* Watson 214; Drouet 190; Seub. & Hochst. 11. *?P. lagopus*, Watson 214, (2) 603, (3) 396; Drouet 190; Seubert 30; Seub. & Hochst. 11.

Corvo (765). Flores (766, 767). Fayal. Graciosa (770). Terceira (769, 771, 772, 773). San Miguel (774, 775; *Carreiro*, 916). Sta. Maria (775, *a*, 775, *b*, 775, *c*, 775, *d*).

*P. CORONOPUS, L. Watson 214, (2) 603; Drouet 190; Seubert 30; Seub. & Hochst. 11.— B. & H. 367. *f. 830.*

Corvo (747, 748, 749, 758). Flores (759). Fayal. Pico (*Brown*, 217). Graciosa (750, 751). Terceira (752, 753, 754, 755). San Miguel (756, 757; *Carreiro*, 104, 125). Sta. Maria (757, *a*, 757, *b*, 757, *c*).

Two unusual forms were collected, which I do not refer elsewhere:— 761, from Corvo, with cuneate-spatulate leaves 2 to 3 in. long, nearly equally 5-toothed near the apex; and 760, from seaside rocks at Sta. Cruz, Flores, with very succulent cuneate leaves 8 to 10 in. long, bearing two broad fulcate lobes near the oblong broader apex.

*P. SERRARIA, L. Watson 214, (3) 382; Drouet 190.— Rchb. **17.** *pl. 1130.*

San Miguel.— Not recently collected.

*LITTORELLA LACUSTRIS, L. Watson 214, (2) 603; Drouet 190.— B. & H. 368. *f. 831.*

Corvo.— Not recently collected.

NYCTAGINACEAE.

MIRABILIS DIVARICATA, Lowe. Watson (2) 603; Drouet 193.— Lowe, Primitiae et Nov. Faun. et Fl. Maderae. 17.

Flores.— Collected many years ago, and possibly the same as the next.

*M. Jalapa, L.— Bot. Mag. **11.** *pl. 371.*

San Jorge (777). Sta. Maria (777, *a*).— Escaped.

The pericarp is striate and slightly rusty-pubescent, not rugose and glabrous as in the preceding.

ILLECEBRACEAE.

*ILLECEBRUM VERTICILLATUM, L. Watson 217, (2) 592, (3) 395; Drouet 159; Seubert 45; Seub. & Hochst. 14.— B. &. H. 370. *f. 834.*

Terceira (778).

AMARANTHACEAE.

AMARANTHUS HYBRIDUS, L. *A. chlorostachys*, Watson 217.— Gray, 428.— Willd. Amarant. *pl. 9, 10.*

Fayal.— Escaped ?

A. HYBRIDUS, var. PANICULATUS, Uline & Bray. *A. strictus*, Watson 217.— Gray, 428.—Willd. Amarant. *pl. 2.*

Flores (779). San Miguel (*Carreiro*, 14).— Escaped.

*†A. LIVIDUS, L.— Willd. Amarant. *pl. 1.*

Flores (780, 781, 782). San Miguel (*Carreiro*, 6). Sta. Maria (782, *a*).

A. BLITUM, L. Watson 217, (2) 603; Drouet, 191.— Gray, 428.— Engl. Bot. 31. *pl. 2212.*

Corvo. Flores. Fayal. Terceira. San Miguel. Of somewhat the aspect of the preceding, but usually with smaller leaves: when in fruit easily recognized by the circumscissile utricle.— Possibly in part referring to the last?

*†A. DEFLEXUS, L. *A. prostratus*, Drouet 191. *Euxolus deflexus*, Watson 217.— Willk. & Lange, Prodr. Fl. Hisp. 1: 277.— Willd. Amarant. *pl. 10.*

Fayal (*Brown*, 236). San Jorge (783). Terceira (784, 785, 786?). San Miguel (*Carreiro*, 6, 18, 21). Sta. Maria. (786, *a*).

ACHYRANTHES ASPERA, L. *A. argentea*, Watson 217, (3) 382; Drouet 191.— Willk. & Lange, Prodr. Fl. Hisp. 1: 277.— Sibth. Fl. Graec. *pl. 244.*

San Miguel.— Not recently collected.

*†ALTERNANTHERA ACHYRANTHA, R. Br. Watson 217; Drouet 191. *A. polygonoides*, Watson (3) 382.— Willk. & Lange, Prodr. Fl. Hisp. 1: 278.— Barker-Webb & Berth. Hist. Nat. Iles Canaries. *pl. 199.*

Graciosa (787 — unusually large-leaved). Terceira. San Miguel (788; *Carreiro*, 10).

Chenopodiaceae.

*†Chenopodium ambrosioides, L. Watson 215, (2) 603; Drouet 191; Seubert 28; Seub. & Hochst. 11.— Gray, 433.— Sturm, 17. *pl. 75.*

Flores. Fayal (*Brown*, 237). San Jorge (795). Graciosa (796). Terceira (797, 798). San Miguel (*Carreiro*, 23).

*†C. murale, L. Watson 215, (2) 603; Drouet 191; Seubert 29; Seub. & Hochst. 11.— B. & H. 375. *f. 847.*

Corvo. Fayal. Pico. San Jorge (789). Graciosa (790). Terceira (791, 792, 793). San Miguel (794; *Carreiro*, 7, 8, 20). Sta. Maria (794, *a*, 794, *b*).

C. rubrum, L. Watson 216, (2) 603, (3) 396; Drouet 192; Seubert 29. *C. blitoides*, Seub. & Hochst. 11.— B. & H. 375. *f. 845.*

Sta. Maria, and other unspecified islands.— Held as doubtful by Mr. Watson.

*†C. album, L.— B. & H. 374. *f. 843.*

Flores (799, Fazazinha; 800, 801?, Ponta Delgada). Terceira (802). San Miguel (*Carreiro*, 15, 19).

*Beta vulgaris, L. *B. maritima*, Watson 215, (2) 603; Drouet 192 — B. & H. 376. *f. 850.*

Corvo (809). Fayal. San Miguel. Sta. Maria (809, *a*, 809, *b*).

*†Atriplex hastata, L. var. salinum, Koch. *A. Babingtonii*, Watson 216. *A. patula*, Watson (2) 603, (3) 391; Drouet 192. *A. portulacoides*, Drouet 192.— B. & H. 378; Willk. & Lange, Prodr. Fl. Hisp. 1: 268.—Schlecht. Lang. & Schenk, Fl. v. Deutschl. 5 Aufl. 9: 214. *pl. 894.*

Corvo (803). Flores (804, 805). Fayal (*Brown*, 238); Pico (*Brown*, 239). Graciosa (806). Terceira (807). San Miguel (808; *Carreiro*, 16). Sta. Maria 808, *a*).— A seaside plant.

*Salsola Kali, L. Watson 217, (2) 603; Drouet 192; Seubert 29; Seub. & Hochst. 11.— B. & H. 373. *f. 840.*

Fayal (*Brown*, 240). San Miguel.

BOUSSINGAULTIA BASELLOIDES, HBK.— Bot. Mag. **64.** *pl. 3620.*

Almost or quite established on walls in several islands. On the possible relation of *Smilax tetragona*, Drouet 200, to this, see DC. Monogr. Phanerog. **1**: 73.

PHYTOLACCACEAE.

*†PHYTOLACCA DECANDRA, L. Watson 215, (2) 605; Drouet 191; Seubert 28; Seub. & Hochst. 11.— Gray, 436.— Bot. Mag. **24.** *pl. 931.*

Corvo. Flores. Fayal (*Brown*, 242). Pico (*Brown*, 243). *San Jorge. Graciosa.* Terceira (811). San Miguel.

POLYGONACEAE.

*†POLYGONUM HYDROPIPEROIDES, Michx.— Gray, 441.— Small, Mem. Dept. Bot. Columbia Coll. **1**: 80. *pl. 27.*

Corvo (812, 813). Flores (814, 815). Terceira (816). San Miguel (817; *Brown*).

*†P. SERRULATUM, Lag. Watson 218. *?P. Persicaria*, Watson (2) 604, (3) 396; Drouet 192; Seubert 29; Seub. & Hochst. 11. *P. dubium*, Drouet 192. *P.* sp., Watson (2) 604, (3) 391, 396.— Willk. & Lange, Prodr. Fl. Hisp. **1**: 289.— *Plate 45.*

Flores (818).— Also ascribed by Mr. Watson to Corvo, Terceira? and San Miguel, perhaps in part on specimens of the preceding.

*P. MARITIMUM, L. Watson 218, (2) 604, (3) 391; Drouet 192; Seubert 29; Seub. & Hochst. 11.— B. & H. 385. *f. 868.*

Fayal (*Brown*, 244). Pico. Terceira (819). San Miguel.

*†P. AVICULARE, L. Watson 218, (2) 604; Drouet 192.— B. & H. 384. *f. 867.*

Corvo (820). Pico (*Brown*, 245). Terceira (821). San Miguel (*Carreiro*). Sta. Maria (821, *a*).

*RUMEX AQUATICUS, L. Watson 218; Seub. & Hochst. 11. *R.* sp., Watson (2) 603.— B. & H. 380. *f. 856.*

Fayal. San Miguel.— Not recently collected.

*†R. CRISPUS, L. Watson 219, (2) 604; Drouet 192.— B. & H. 381. *f. 857.*

Corvo (823). Flores (824). Graciosa (825). Terceira (826). San Miguel (*Carreiro*, 210). Sta. Maria (826, *a*).

*†R. OBTUSIFOLIUS, L. *?R. strictus*, Seubert 29; Watson (2) 604, (3) 396; Drouet 192.— B. & H. 381. *f. 858.*

Corvo (827, 828). Flores (829, 830). Terceira (831). San Miguel (822).

*†R. OBTUSIFOLIUS × CRISPUS.— Trelease, Rept. Mo. Bot. Gard. **3**: 92. *pl. 31.*

San Miguel (832,— in the deep ravine above Lagoa das Furnas).

*†R. CONGLOMERATUS, Murr. Watson 219; Drouet 192. *?R. acutus*, Watson (2) 604.— B. & H. 381. *f. 860.*

Corvo (833). Flores (834, 835, 839). Fayal (*Brown*, 247, 248, 298). Terceira (836). San Miguel (837, 838; *Brown*, 249; *Carreiro*, 175). Sta. Maria (838, *a*).

*†R. PULCHER, L. Watson 219, (2) 604; Drouet 192.— B. & H. 382. *f. 862.*

Corvo (840). Flores (841). Fayal. San Jorge (842). Graciosa (843). Terceira (844). San Miguel (845). Sta. Maria (845, *a*, 846, *a*).

*R. BUCEPHALOPHORUS, L. Watson 219, (2) 604; Drouet 192; Seubert 29; Seub. & Hochst. 11.—Willk. & Lange, Prodr. Fl. Hisp. **1**: 284.—Sibth. Fl. Graec. *pl. 345.*

Pico. Terceira (846). San Miguel (847). Sta. Maria (847, *a*).

*†R. ACETOSELLA, L. Watson 219, (2) 604; Drouet 192; Seub. & Hochst. 11.— B. & H. 383. *f. 865.*

Corvo (848). Flores (849, 850). Fayal. Terceira (851, 852). San Miguel (853; *Brown*, 246; *Carreiro*). Sta. Maria (853, *a*).

MUEHLENBECKIA SAGITTIFOLIA, Meisn. DC. Prodr. **14**: 148.— Fl. Bras. **14.** *pl. 22.*

Flores (854). Terceira (855).— Cultivated, and, like *Boussingaultia*, becoming wild on walls.

Lauraceae.

***Persea Azorica**, Seubert 29. *pl. 6;* Watson (2) 605, (3) 392; Drouet 193. *Laurus Canariensis*, Watson 220; Seub. & Hochst. 11. *L. Canariensis*, var. *Azorica*, Seub. & Hochst. 11.

Flores (856). Fayal (*Brown*, 250, 251). Pico (*Brown*, 252). Terceira (857). San Miguel (858, 859, 860, 861; *Carreiro*). Sta. Maria (861, *a*).

*P. Indica, Spreng. Watson 220, (2) 605; Drouet 193.— Barker-Webb & Berth. Hist. Nat. Iles Canar. *pl. 204.*

Flores (862). Fayal. Terceira (863). San Miguel (*Carreiro*). Sta. Maria (863, *a*).

Ocotea foetens, B. & H. *Oreodaphne foetens*, Watson 220; Drouet 193.— Barker-Webb & Berth. Hist. Nat. Iles Canar. *pl. 205*.

Terceira.— Perhaps doubtfully established.

Thymelaeaceae.

*Daphne Laureola, L. Watson 220, (1) 400, 407, (2) 605; Drouet 193; Seubert 30. *D. Gnidium*, Seub. & Hochst. 11.— B. & H. 388. *f. 879.*

Pico. Also formerly in San Miguel.

Euphorbiaceae.

Ricinus communis, L. Seubert 28; Watson (2) 606, (3) 396; Drouet 194.— Hayne, Arzneig. 10. *pl. 48.*

Fayal. San Miguel.— Scarcely escaped.

***Euphorbia Stygiana**, Watson, Lond. Journ. Bot. **3**: 605. *E. Styxiana*, Watson (3) 392. *E. mellifera*, Watson 221; Drouet 194; Seubert 27. *E.* sp., Watson (1) 129.— *Plate 46.*

Corvo. Flores (864). Fayal. Pico. San Miguel.

*E. Lathyris, L. Watson 221, (2) 606; Drouet 194; Seubert 27; Seub. & Hochst. 11.— B. & H. 394. *f. 890.*

Fayal. Pico. San Miguel.

Aspect of the next, but with opposite lower leaves, larger capsules, etc.

***E. Azorica,** Hochst. in Seubert 27 ; Watson 222, (2) 606 ; Drouet 194. *E. diversifolia*, Seub. & Hochst. 11. *?E. Esula*, *?E. Gerardiana*, *?E. Portlandica*, Drouet 194. *? E. platyphyllos*, Seub. & Hochst. 11.— *Plate 47.*

Flores (865, 866). Fayal. Pico (*Brown*, 253, 254). San Jorge (867). Terceira ? (*E. Portlandica*, Drouet). San Miguel (868; *Carreiro*, 27).— Somewhat variable and commonly reduced to a variety of *E. pinea*, L.

*E. EXIGUA, L. Watson 222, (2) 606 ; Drouet 194.— B. & H. 394. *f. 889.*

Fayal. San Miguel.

*E. PEPLUS, L. Watson 222, (2) 606; Drouet 194.— B. & H. 393. *f. 888.*

Flores. Fayal (*Brown*, 255). Graciosa (869, 874). Terceira (870, 871). San Miguel (872 ; *Carreiro*, 178).

*E. PEPLIS, L. Watson 222, (2) 606 ; Drouet 194 ; Seub. & Hochst. 11 ; Seubert 27.— B. & H. 392. *f. 883.*

Fayal (*Brown*, 256). Pico. Terceira (873). San Miguel.

*E. Preslii, Guss.— Gray, 453.

Pico. (*Brown*, 257).

BUXUS SEMPERVIRENS, L. Watson (2) 605; Drouet 194.— Rchb. 5. *pl. 153.*

***Flores*. Fayal. San Miguel.— Escaping.**

*MERCURIALIS ANNUA, L. Watson 222, (2) 606 ; Drouet 195.— B. & H. 396. *f. 896.*— Rchb. 5. *pl. 151* (as *M. ambigua*).

Fayal. San Jorge (876, 877). Graciosa (878, 879, 880). San Miguel (*Carreiro*, 147). Sta. Maria (880,*a*).

Nos. 877, 879, 880, *a*, and *Carreiro*, 147, are monoecious, therefore falling under the variety *ambigua*.

URTICACEAE.

ULMUS CAMPESTRIS, L. Watson 224; Drouet 196.— B. & H. 401. *f. 907.*

Fayal. Terceira. San Miguel. *Sta. Maria*.— Escaping.

URTICA MEMBRANACEA, Poir. Watson 223 ; Drouet 195 ; Seub. & Hochst. 11. *U. Azorica*, Hochst. in Seubert

28. *pl.* 7; Seub. & Hochst. 11; Watson (2) 606, (3) 392; Drouet 195. ?*U. Lowei*, Seubert 28; Watson (2) 606, (3) 396, (referred in Index Kewensis to *U. morifolia*, Poir, of the Canary Islands). *U. rupestris*, Seub. & Hochst. 11. *U. urens*, Seub. & Hochst. 11.

Flores (885). Fayal (*Brown*, 258). Pico. San Jorge (886, 887). Graciosa (888). Terceira (889). San Miguel (890; *Brown*, 259; *Carreiro*, 86, 141). Sta. Maria (890, *a*, 890, *b*).

*PARIETARIA OFFICINALIS, L. Watson 223, (2) 606; Drouet 195; Seubert 28; Seub. & Hochst. 11.— B. & H. 400. *f. 904.*

Flores (882). Fayal. Terceira (883). San Miguel (884). Sta. Maria (884, *a*).

*P. DEBILIS, Forst. ?*P. Lusitanica*, Watson 223, (2) 606; Drouet 195.— S. Wats. Bot. Calif. 2: 65.

Corvo (881). Pico. (*Brown*, 260). San Miguel (*Carreiro* 22).

MYRICACEAE.

*MYRICA FAYA, Dryander, in Ait. Hort. Kew. 3: 397. Watson 223, (2) 606; Drouet 196; Seubert 27; Seub. & Hochst. 10.— Nouveau Duhamel, 2. *pl. 56.*

Corvo (891). Flores (892, 893, 894, 895). Fayal (*Brown*, 262). Pico. Graciosa (896). San Miguel (*Carreiro*). Sta. Maria (896, *a*, 896, *b*).

EMPETRACEAE.

*COREMA ALBUM, Don. Watson 221, (2) 605; Drouet 194; Seubert 27.— Willk. & Lange, Prodr. Fl. Hisp. 3: 512.—Hoffmg. & Lk. Fl. Port. *pl. 72.*

Fayal. Pico. San Miguel (897; *Brown*, 261; *Carreiro*, 26).

CERATOPHYLLACEAE.

*Ceratophyllum demersum, L. Watson 223, (2) 591; Drouet 166.— B. & H. 397. *f. 899.*

Flores (898,— Sterile, like the specimens collected in the same island by Mr. Watson, many years ago).

SALICACEAE.

SALIX FRAGILIS, L. Watson 224, (2) 606; Drouet 195.—B. & H. 409. *f. 917.*

Fayal. Pico. *Sta. Maria.*—Escaping.

POPULUS NIGRA, L. Watson 224, (2) 606; Drouet 196.—B. & H. 414. *f. 933.*

Flores. Sta. Maria. Reported from the greater part of the archipelago.—Escaping.

ORCHIDACEAE.

*SERAPIAS CORDIGERA, L. Watson 225, (1) 8, (2) 607; Drouet 199; Seubert 25; Seub. & Hochst. 10.—Willk. & Lange, Prodr. Fl. Hisp. **1**: 162.—Rchb. **13**. *pl. 440.*

Fayal. Pico. Terceira (902). San Miguel (903).

The flowers of some specimens are unusually pale, and my single specimen from San Miguel has one stalked and one sessile tuber, as in *S. neglecta*.

***Habenaria micrantha**, Hochst. in Seubert 25. *pl. 5;* Watson 225, (2) 607; Drouet 199.

Flores. Fayal. Pico. Terceira (904). San Miguel (905, 906; *Carreiro*, 222). Sta. Maria.

***H. longebracteata**, Hochst. in Seubert 25. *pl. 5;* Watson 225, (2) 607; Drouet 199.

Flores. San Miguel (907, 908, 909). Sta. Maria.

My specimens do not satisfactorily correspond to the descriptions of these two species of *Habenaria*.

SCITAMINEAE.

*Hedychium Gardnerianum, Rosc.— Bot. Reg. 9. *pl. 774.*

Flores (910, 911). *San Miguel.*

Originally introduced as a greenhouse plant, now thoroughly established and considered in the gardens a troublesome weed.

CANNA INDICA, L. Drouet 200; Seubert 25; Watson (1) 6.—Bot. Mag. **13**. *pl. 454.*

Indefinitely reported as escaping about gardens.

IRIDACEAE.

*IRIS FOETIDISSIMA, L. Watson 226; Drouet 199.— B. & H. 449. *f. 1016.*

Fayal. San Miguel. Sta. Maria (911, *a*).

I. GERMANICA, Watson 226. *I.* sp., Watson (2) 607.— Rchb. **9.** *pl. 338.*

Flores.— Escaped: not recently collected.

*ROMULEA COLUMNAE, Seb. & Maur. *Trichonema Columnae*, Watson 226, (3) 382; Drouet 199.— B. & H. 450. *f. 1019.*

San Miguel.— Not recently collected.

GLADIOLUS SEGETUM, Ker-Gaw. Watson 226; Drouet 199. *G.* sp., Watson (2) 607.— Bot. Mag. **19.** *pl. 719.*

Fayal.— Escaped.

AMARYLLIDACEAE.

*Amaryllis Belladonna, L. Watson 226, (1) 6, (2) 607; Drouet 200; Seubert 25.— Bot. Mag. **19.** *pl. 733.*

Flores. Fayal. *Terceira*. *San Miguel*.— Established, from gardens.

AGAVE AMERICANA, L. Watson 226; Drouet 200.— Gartenflora, **41.** 270. *f. 51.*

Sta. Maria.— Very abundantly planted everywhere for forage, but doubtfully escaping.

NARCISSUS TAZETTA, L. subsp. PAPYRACEUS, Baker, Handb. Amaryllid. 8. *N. stellatus*, Watson 226. *N.* sp., Watson (2)608; Drouet 199.— Bot. Mag. *pl. 947.*

Fayal.— Escaped: not recently observed.

LILIACEAE.

*ALLIUM AMPELOPRASUM, L. Watson 227; Drouet 201.— B. & H. 463. *f. 1046.*

Fayal (*Brown*, 263). Graciosa (912). San Miguel.

*A. SUBHIRSUTUM, L. Watson 227, (3) 383; Drouet 201.— Willk. & Lange, Prodr. Fl. Hisp. **1**: 212.— Rchb. **10.** *pl. 502.*

San Miguel.— Not recently collected.

*A. ROSEUM, L.— Willk. & Lange, Prodr. Fl. Hisp. **1**: 210.— Rchb. **10.** *pl. 504.*

Terceira (913). Sta. Maria (913, *a*).

URGINEA SCILLA, Steinh. Seubert 24; Drouet 201. *Scilla maritima*, Watson 227, (2) 607, (3) 396.— Willk. & Lange, Prodr. Fl. Hisp. **1**: 215.— Rchb. **10.** *pl. 466.*

Vaguely reported by Seubert; possibly, as suggested by Mr. Watson, having reference to *Amaryllis Belladonna*.

*Ruscus aculeatus, L. Watson 227, (3), 383; Drouet 200.— B. & H. 458. *f. 1034.*

Flores (914). Pico (*Brown*, 264). Terceira (915). San Miguel (*Carreiro*, 1).

R. androgynus, L. Seubert 25; Watson (2) 608, (3) 396; Drouet 200.— Bot. Mag. **44.** *pl. 1898.*

Fayal. Pico.— Escaping. Not recently collected.

*Smilax divaricata, Sol. Watson (2) 608. *S. Canariensis*, Watson 227, in part. *S. Canariensis*, *β. divaricata*, A. DC. Monog. Phanerog. **1**: 72.

Pico.

The first of the forms referred to by Mr. Watson: not recently collected.

*S. excelsa, L. *S. Canariensis*, Watson 227, in part. *S. tetragona*, Seubert 24; Seub. & Hochst. 10. ? *S. aspera*, Drouet 200.— A. DC. *l. c.* 73.— Nouveau Duhamel, **1**. *pl. 54.*

Pico (*Brown*, 265). San Miguel (*Brown*, 266, at the Sete Cidades).

Commelinaceae.

Tradescantia multiflora, Sw.— Jacquin, Icones. **2.** *pl. 355.*

Flores (915, *a*). Fayal (*Brown*).— Escaped.

Zebrina pendula, Schnitzl.— Revue Hort. 1855. *pl. 8.*

San Jorge (*Brown*).— Escaping.

Juncaceae.

***Luzula purpureo-splendens**, Seubert 23. *pl. 4;* Watson 231; Drouet 201. *L. purpurea*, Watson, Lond. Journ. Bot. **3**: 608, (3) 393. *L. elegans*, Seub. & Hochst. 10. *L. Azorica*, Watson (1) 408.

Corvo (916). Flores (917, 918). Fayal. Pico (*Brown*, 301). Terceira (919). San Miguel (920, 921; *Brown*, 267; *Carreiro*, 615).

*L. campestris, DC. Watson, 232; Drouet 200.— B. & H. 474. *f. 1078.*

San Miguel. Sta. Maria.— Not recently collected.

*Juncus effusus, L. Watson 232, (2) 609; Drouet 201.— B. & H. 469. *f. 1059;* Corbière, 580.

Corvo (922, 923, 924). Flores (925). Fayal (*Brown*, 268). Terceira (926). San Miguel (927, 928, 929, 930, 931; *Carreiro*, 9, 69, 766). Sta. Maria (931, *a*).

The specimens range in all degrees between 923, which is typical *J. effusus*, and 929, which is a densely glomerate form of var. *conglomeratus*.

*J. GLAUCUS, Sibth. Watson 232; Drouet 201.— B. & H. 469. *f. 1059.*

Sta. Maria.— Not recently collected.

*J. ACUTUS, L. Watson 232, (2) 609; Drouet 201; Seubert 24; Seub. & Hochst. 10. *J. multibracteatus*, Drouet 202.— B. & H. 472. *f. 1071.*

Flores (932). Fayal. Terceira (933). *San Miguel.* Sta. Maria (933, *a*).

*J. MARITIMUS, Lam. Watson 232, (2) 609, (3) 396; Drouet 202; Seubert 24; Seub. & Hochst. 10.— B. & H. 472. *f. 1070.*

Terceira.— Collected many years ago.

*J. CAPITATUS, Weigel. Watson 232, (2) 609; Drouet 202; Seubert 24; Seub. & Hochst. 10.— B. & H. 471. *f. 1069.*

Corvo (940). Flores. Fayal. Terceira. San Miguel.

*J. TENUIS, Willd. Watson 232, (2) 609; Drouet 202. *J. lucidus*, Hochst. in Seubert 24. *pl. 4;* Seub. & Hochst. 10; Drouet 200.— B. & H. 471. *f. 1065.*

Corvo (934). Pico. Fayal. Terceira (935). San Miguel (936).

While all but 935 are more representative *J. tenuis*, that number agrees with Hochstetter's figure.

*J. BUFONIUS, L. Watson 233, (2) 609; Drouet 202; Seubert 24; Seub. & Hochst. 10. *J. hybridus*, Seub. & Hochst. 10; Drouet 202. *J. bufonius*, β. *fasciculatus*, Seubert 24.—B. & H. 471. *f. 1067.*

Corvo (937, 938). Flores (939, 1001). Fayal. Terceira. San Miguel (941). Sta. Maria (941, *a*).

*J. SUPINUS, Moench. Watson 233; *J. uliginosus*, Watson (2) 609; Drouet 202; Seubert 24.— B. & H. 470; Corbière, 582.— Rchb. **9.** *pl. 397.*

Corvo (942). Flores (943, 944, 970). San Miguel (945, 946, 947, 948, 949; *Carreiro*, 15).

The frequent aquatic form is the *J. fluitans*, Lam.

*J. LAMPOCARPUS, Ehrh. *J. lamprocarpus*, Watson 233.—B. & H. 470; Corbière, 581.—Rchb. **9**. *pl. 405*.

Terceira (950, 951). San Miguel (952, 953, 954, 955, 956; *Brown*, 269; *Carreiro*).

ARACEAE.

*ARUM ITALICUM, Mill. Watson 230, (2) 608; Drouet 198; Seubert 26; Seub. & Hochst. 9. ? *A. vulgare*, Drouet 198.—B. & H. 420.—Rchb. **7**. *pl. 11*.

Terceira (*Sampaio*). San Miguel.

*ARISARUM VULGARE, Targ. Tozz. *A. Azoricum*, Schott, Oesterr. Bot. Wochenbl. 1857. 190. *Arum Arisarum*, Watson 231; Drouet 198.—Var. Subexsertum, Engl. Monogr. 2: 564.—Rchb. **7**. *pl. 7*.

Fayal. San Miguel.— Not recently collected.

COLOCASIA ANTIQUORUM, Schott. Watson 231, (2) 608; Drouet 198; Seubert 26. *Caladium esculentum*, Watson (1) 7.—Nicholson, Gard. Dict. **2**: 362.— Rept. Mo. Bot. Gard. **6**. *pl. facing p. 11*.

Escaping more or less in nearly all of the islands.— San Miguel (957).

RICHARDIA AFRICANA, Kunth.— Bot. Mag. **21**. *pl. 832* (as *Calla Aethiopica*).

Sta. Maria.— Escaped along the ribeira east of Villa do Porto.

LEMNACEAE.

*LEMNA MINOR, L. Watson 230, (2) 608, (3) 396; Drouet 198; Seubert 26; Seub. & Hochst. 9.— B. & H. 421. *f. 945*.

Terceira (958, 959).— Abundant at the higher altitudes, above Angra; also in the public garden of that city.

ALISMACEAE.

*ALISMA PLANTAGO, L. Watson 231.— B. & H. 430. *f. 969*.

Sta. Maria (959, *a*, 959, *b*).

The very narrow-leaved form (as in Madeira), which has been called var. *lanceolata*, but is not separated by Micheli in DC. Monogr. Phanerog. 3· 32.

NAIADACEAE.

*POTAMOGETON PUSILLUS, L. Watson 228, (2) 608; Drouet 198. — B. & H. 428. *f. 965*. — Rchb. 7. *pl. 22*.

Flores (960). San Miguel (961). Sta. Maria (961, *a*).

As none of my specimens are in fruit, it cannot be said positively that they do not represent the Canary Island *P. denticulatus*, Lk., which, though merged into this species in Index Kewensis, is kept apart by some students of the genus.

P. PECTINATUS, L. Watson 228, (2) 608, (3) 396; Drouet 198; Seubert 25; Seub. & Hochst. 9.— B. & H. 428. *f. 966*.— Rchb. 7. *pl. 19*.

Terceira.— Not recently collected, and very likely the preceding.

*P. LUCENS. L.? Watson 228, (3) 383; Drouet 198.— B. & H. 426. *f. 958*. — Rchb. 7. *pl. 36*.

San Miguel (962, Lagoa das Furnas).

Concerning this, Mr. Arthur Bennett, who was good enough to look over my specimens of this difficult genus, says that though he is not prepared to propose a new name for it, it is not typical *P. lucens*, but somewhat approaches *P. fluitans* in fruit characters.

*P. LESCHENAULTII, Cham. & Schl. Linnaea. 2: 223. *pl. 6, f. 23*.

Sta. Maria (969, *a*, 969, *b*, 969, *c*).

Placed under *P. fluitans* in Index Kewensis.

*P. POLYGONIFOLIUS, Pourr. Watson 229. *P. heterophyllus*, Watson (2) 608, (3) 392; Drouet 198. ?*P. natans*, Seubert 25; Drouet 197; Watson (2) 608.— Rchb. 7. *pl. 44*.

Corvo (963). Flores (964, 965, 966). Fayal. Pico. Terceira (967). San Miguel (968, 969; *Brown*, 270).

*P. NATANS, L. ?Drouet 197; Seubert 25; Seub. & Hochst. 9; Watson (2) 608, (3) 392, in part.— Rchb. 7. *pl. 50*.

Mr. Bennett writes me that this occurs in the Berne herbarium from the Azores, collected by Mr. Hunt, — hence presumably from San Miguel or possibly Sta. Maria.

CYPERACEAE.*

*CYPERUS BADIUS, Desf. *C. longus*, Watson 234, (2) 610; Drouet 202; Seubert 23; Seub. & Hochst. 10.— B. & H. 477. *f. 1081.*

Flores (973). Fayal (*Brown*, 274). Graciosa (974). Terceira (975. 976). San Miguel (977; *Carreiro*, 87). Sta. Maria (977, *a*, 977, *b*).

I have seen no specimens with the long-stalked compound umbels which mark the form usually called *C. longus*, which, however, is not held separate in the Index Kewensis.

*C. ROTUNDUS, L.— Gray, 571.— Weyhe, Wolter & Funke. Pl. Offic. **1**. *pl. 28.*

San Miguel (*Carreiro*, 174, *a*).

*†C. ESCULENTUS, L. Watson 234, (2) 610; Drouet 202; Seubert 23. *C. aureus*, Drouet 202. *C. Tenorei*, Seub. & Hochst. 10.— Gray, 571.— Sturm, Deutschl. Fl. **13**. *pl. 52.*

Corvo (978, 979). Flores (980). Fayal (*Brown*, 271). Pico (*Brown*, 272). Terceira (981; *Sampaio*). San Miguel (982; *Brown*, 273; *Carreiro*, 613).

*C. vegetus, Willd. Watson 234, (2) 610; Drouet 202.— Willk. & Lange, Prodr. Fl. Hisp. **1**: 138.

Corvo (971). Flores (972).

*SCIRPUS MARITIMUS, L. Watson 235, (2) 610, (3) 396; Drouet 203; Seubert 23; Seub. & Hochst. 10.— B. & H. 484. *f. 1102.*

Terceira.

*S. SETACEUS, L. Watson 235, (2) 610; Drouet 203.— B. & H. 482. *f. 1096.*

Corvo. Flores (983). Fayal. San Miguel (984; *Carreiro*, 6, 33).

*S. CERNUUS, Vahl. *S. Savii*, Watson 235, (2) 610; Seub. & Hochst. 10. *Isolepis Saviana*, Drouet 203; Seubert 23.— B. & H. 482. *f. 1097.*

Corvo (985, 986). Flores (987, 988, 989, 990).

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* Determinations of *Carex* by Professor L. H. Bailey.

Fayal. Pico. Terceiro (991). San Miguel (992). Sta. Maria (992, *a*, 992, *b*, 992, *c*).

*S. FLUITANS, L. Watson 235, (2) 610. *Isolepis fluitans*, Drouet 203; Seubert 23; Seub. and Hochst. 10.— B. & H. 482. *f. 1095.*

Pico. Terceira. San Miguel (993, 994; *Brown*, 275; *Carreiro*, 4, 35).

*ELEOCHARIS PALUSTRIS, R. Br. Drouet 202; Seubert 23. *Scirpus palustris*, Watson 235, (2) 610.— B. & H. 481. *f. 1091.*

Corvo. Flores (1000, in Caldeira da Lomba).

My specimens very tall, often solitary at the remote nodes of the rhizome, and with the spikes as much as an inch and a half long, in aspect recalling the South African *E. limosa.*

*E. MULTICAULIS, Dietr. Drouet 202; Seubert 23. *Scirpus multicaulis*, Watson 235, (2) 610; Seub. & Hochst. 10.— B. & H. 481. *f. 1092.*

Flores (995, 996). Pico. Fayal. Terceira (1001). San Miguel (997, 998, 999; *Carreiro*, 5, 34). Sta. Maria (999, *a*).— Generally proliferous.

*CLADIUM GERMANICUM, Schrad. *C. Mariscus*, Watson 234, (2) 610; Drouet 202.— B. & H. 478. *f. 1084.*

Flores. San Miguel.— Not recently collected.

***Carex Azorica*, Gay.** Watson 236, (2) 610; Drouet 203; Seubert 21; Seub. & Hochst. 10.— *Plate 48.*

Flores (1550). Fayal. Pico. San Miguel (1551).

*C. DISTANS, L.— B. & H. 498. *f. 1142.*

Flores (1552).

*C. ECHINATA, Murr. *C. stellulata*, Watson 236, (2) 610; Drouet 203; Seubert 21; Seub. & Hochst. 9. *C. stellulata*, var. *Grypos*, Seubert 21; Drouet 203.— B. & H. 490. *f. 1115.*

Flores (1553). Fayal. Pico. San Miguel.

*C. FLAVA, var. OEDERI, Lilj. *C. flava*, Watson 236, (2) 610; Drouet 203; Seubert 21; Seub. & Hochst. 10.— B. & H. 498. *f. 1141.*

Flores. Fayal. Pico. Terceira (1554). San Miguel (1555, 1556, 1557, 1558; *Carreiro*, 14).

*C. **Hochstetteriana**, Gay in Seubert 22. *pl. 2*; Drouet 203; Watson (2) 611. *C. Hochstetterorum*, Watson 237. *C. Hochstetteri*, Seub. & Hochst. 10.

Flores (1559, 1560). Fayal. Terceira. San Miguel.

*C. MACROSTYLA, Lapeyr., var. PEREGRINA, L. H. Bailey. *C. peregrina*, Lk. *C. sagittifera*, Watson 235, (2) 610. *C. Guthnickiana*, Gay, Ann. Sci. Nat. Bot. ii. **10**: 289; Drouet 203; Seubert 20; Seub. & Hochst. 10.— *Plate 49.*

Flores (1561). Fayal. Pico. Terceira (1562). San Miguel (1563, 1563, *a*; *Carreiro*, 16, 62).

*C. MURICATA, L. Seub. & Hochst. 9.— B. & H. 492. *f. 1121.*

Flores (1564, at Fazazinha,— two specimens, collected with the next).

*C. MURICATA, var. DIVULSA, Wahl. *C. divulsa*, Watson 236, (2) 610; Drouet 203; Seubert 21.— B. & H. 493.— Rchb. **8**. *pl. 220.*

Flores (1565). Fayal. San Jorge (1566). Graciosa (1567). Terceira (*Sampaio*). San Miguel (1568, 1569; *Carreiro*, 203). Sta. Maria (1569, *a*, 1569, *b*, 1569, *c*, 1569, *d*, 1569, *e*).

*C. PENDULA, Huds. Watson 237, (2) 611. *C. myosuroides*, Seubert 23; Seub. & Hochst. 10; Drouet 203.— B. & H. 500. *f. 1151.*

Flores (1570). Fayal. San Miguel.

*C. PUNCTATA, Gaud. *C. laevicaulis*, Hochst. Watson 236, (2) 610; Drouet 203; Seubert 21; Seub. & Hochst. 10. C. *rigidifolia*, Hochst. in Seubert 21. *pl. 2;* Watson 237, (2) 611, (3) 396; Drouet 203; Seub. & Hochst. 10.— Rchb. **8**. *pl. 251.*

Flores (1571, 1572). Pico. Terceira (1573). Sta. Maria (Hunt).

I follow the Index Kewensis in placing *C. laevicaulis* and *C. rigidifolia* under *C. punctata*.

*C. **Vulcani**, Hochst. in Seubert 22. *pl. 3*; Watson 237, (2) 610; Drouet 203; Seub. & Hochst. 10. *C. Floresiana*, Hochst. *l. c. pl. 3;* Watson 237, (2) 610;

Drouet 203; Seub. & Hochst. 10. *C. Watsoni*, Boott, Ill. Carex. 4: 203; Watson (2) 610.

Flores? Fayal. Pico. Terceira (1574). San Miguel (1575, 1576; *Carreiro*).

I follow Index Kewensis in this disposal of *C. Floresiana* and *C. Watsoni*.

*C. VULPINA, L. Watson 236, (2) 610; Drouet 202.— B. & H. 492. *f. 1120.*

Corvo (1577). Flores (1578, 1579).

GRAMINEAE.

*†PANICUM SANGUINALE, L. Watson 239; Drouet 204; Seubert 18; Seub. & Hochst. 10. *Digitaria sanguinalis*, Watson (2) 611.— B. & H. 508. *f. 1157.*

Corvo (1002). Flores (1003). Fayal. Pico (*Brown*, 280). Graciosa (1004). Terceira (*Sampaio*). *San Miguel.*

*†P. CRUS-GALLI, L. Watson 239, (2) 612; *P. Crus-galli*, var. *aristata*, Drouet 204.— B. & H. 509. *f. 1162.*

Flores (1005). Fayal. Pico. Graciosa (1006). Terceira (1007). San Miguel (*Brown*, 276).

*†SETARIA GLAUCA, Beauv. Watson 239, (2) 611; Drouet 204; Seubert 18; Seub. & Hochst. 10.— B. & H. 508. *f. 1160* (under *Panicum*).

Flores (1008, 1009, 1010, 1011). Fayal. Pico. Graciosa (1012). Terceira (1013), San Miguel (*Brown*, 277; *Carreiro*).

*†S. VERTICILLATA, Beauv. Watson 239, (2) 611, (3) 393; Drouet 204. *?S. viridis*, Drouet 204.— B. & H. 508. *f. 1159* (under *Panicum*).

Fayal. Terceira? San Miguel (1014).

*ANTHOXANTHUM ODORATUM, L. Watson 239, (2) 612; Drouet 204; Seubert 18; Seub. & Hochst. 10.— B. & H. 510. *f. 1164.*

Corvo (1015). Flores (1016, 1017). Fayal. Pico. Terceira (*Sampaio*). San Miguel (1018; *Carreiro*, 97).

ORYZOPSIS MULTIFLORUS, (Cav.). *Piptatherum multiflorum*, Watson 242, 243.— Parlatore, Fl. Ital. **1**: 159 (as *Milium*).— Sibth. Fl. Graeca. **1.** *pl. 66.*

Corvo?—Regarded with some doubt by Mr. Watson.

*POLYPOGON MONSPELIENSIS, Desf. Watson 242, (2) 612; Seub. & Hochst. 10. *P. Monspeliensis*, *β. minor*, Seubert 18; Drouet 205.— B. & H. 515. *f. 1178.*

Flores (1022, 1023). Fayal. Pico. Terceira (1024). Sta. Maria (1024, *a*, 1024, *b*).

*P. MARITIMUS, Willd. Watson 242, (2) 612; Drouet 205; Seubert 18; *?P. maritimus*, var. *mutica*, Seub. & Hochst. 10.— Corbière, 634; Parlatore, Fl. Ital. **1**: 200.— Rchb. **1.** *pl. 75 or 92.*

Corvo (1019). Flores (1020, 1021). Fayal (*Brown*, 281). Terceira. San Miguel (1025; *Carreiro*).

*AGROSTIS VERTICILLATA, Vill. Watson 241, (2) 612; Drouet 205; Seubert 18.— Corbière, 632.— Rchb. **1.** *pl. 76.*

Flores (1026, 1027). Fayal (*Brown*, 299). Terceira (1028; *Sampaio*). San Miguel (1029, 1030; *Carreiro*). Sta. Maria (1030, *a*, 1030, *b*).

***A. verticillata* × Castellana?**

Flores (1031, at Coste, 1033, along the Vea).

Of the aspect of large specimens of the former and with its broad flat striate slightly scabrous leaves, oblong ligule, and puberulent outer glumes, but the inflorescence of more ample and open forms of the latter: empty glumes subequal, twice as long as the flower; palet nearly as long as the flowering glume, which is erose and sub-biaristulate at top and with a straight dorsal awn of its own length arising shortly below the apex.— *Plate 50.*—A puzzling plant, agreeing closely with *A. Simensis*, Hochst. of Abyssinia, which, however, would be an extremely unlikely plant for the westernmost Azores.

*A. ALBA, L. Watson 241, (2) 612; Drouet 204.— B. & H. 516. *f. 1180.*

Corvo. Flores (1052). Fayal. Pico (*Brown*, 306?). San Miguel (1032). Sta. Maria (1033, *a*).

A. ALBA, var. DENSIFLORA, Guss.?—Parlatore Fl. Ital. **1**: 181.

Sta. Maria (1033, *b*, 1033, *c*).

A broad-leaved plant with pubescent outer glumes but awnless flowers, otherwise much resembling the supposed hybrid referred to above, and possibly merely a form of the same thing.

*A. CASTELLANA, Boiss. & Reut. Willk. & Lange. Prodr. Fl. Hisp. **1**: 53.

a. With ample pyramidal long exserted panicle, and flowering-glume mostly without dorsal awn. *A. vulgaris*, Watson 241.— *Plate 51.*

Pico. San Jorge (1053). San Miguel (1055, 1058, 1061; *Carreiro*, 56). Sta. Maria (1063, *a*).

b. With a long bent deeply dorsal awn, otherwise like *a*. *?A. alba*, *β*. Drouet 204. *?A. stolonifera*, Seub. & Hochst. 10. *A. Ecklonis*, var. *longearistata*, Hackel, of the herbarium of Ponta Delgada, and ? of Hackel, Cat. Gram. Port. 34.— *Plate 52.*

Corvo (1041). Flores (1048, 1049, 1051). San Miguel (1057, 1060, 1063; *Carreiro*, 63, 71, 73).

c. Like *b*, but the flowering glume and sometimes the palet more or less loose-hairy, thus approaching var. *pilosa*, Coincy, Cl. Pl. Hisp. **2**: 27.— *Plate 53.*

Flores (1046, 1047, 1050). Fayal (*Brown*, 283). Terceira (1054). San Miguel (1062; *Carreiro*, 53, 57).

d. With the culm mostly leafly up to the narrow oblong panicle, the ligule often elongated. *Deyeuxia Azorica*, Hochst. in Seubert 19; Seub. & Hochst. 10; Watson 241, (2) 612, (3) 393; Drouet 205.— *Plate 54.*

Corvo. Fayal (*Brown*, 308). Pico. Terceira. San Miguel (*Carreiro*, 13, 54, 65, 77). Sta. Maria (1060, *a*).

e. Passing into *d*, but usually less than a span high and mostly cespitose. *A. Castellana*, forma *contracta*, Hackel, of the Ponta Delgada museum. *A. pallida*, Watson (2) 612, (3) 393; Drouet 205. *Deyeuxia caespitosa*, Hochst. in Seubert 18; Seub. & Hochst. 10; Watson 241, (2) 612; Drouet 205.— *Plate 55.*

Corvo (1040, 1042, 1043). Flores (1044, 1045). Fayal. Pico. San Miguel (1056, 1059; *Carreiro*, 60, 61, 68).

f. Intermediate in habit between *d* and *e*, but more rigid, subglaucous, and with the rather short dorsal awn inserted above the middle of the flowering glume ;— approaching var. *Hispanica*.— *Plate 56.*

Flores (1064, at Coste).

A careful examination of the many forms of this polymorphous species, which is the most abundant of the native grasses, makes it almost certain not only that it comprises *Agrostis vulgaris* and *A. pallida* of the Azorean lists, but that the reference of the two Deyeuxias of Hochstetter to *A. pallida* in the Index Kewensis can hardly be maintained. All specimens, especially those of form *b*, which in aspect resemble *A. pallida*, differ constantly in the presence of a palet and in the characters of the flowering glume.

*Gastridium australe, Beauv. Watson 242, (2) 612; Drouet 205; Seubert 18. *G. lendigerum*, Seub. & Hochst. 10; Drouet 205.— B. & H. 517. *f. 1184.*

Flores (1034, 1035). Fayal. Pico (*Brown*, 282). Graciosa (1036, 1037, 1038). San Miguel (1039; *Carreiro*, 164, *a*). Sta. Maria (1039, *a*).

*Lagurus ovatus, L. Watson 243, (2) 612; Drouet 206; Seubert 19; Seub. & Hochst. 10.— B. & H. 514. *f. 1177.*

Flores. Fayal (*Brown*, 284). Terceira (1065; *Sampaio*).

*Holcus lanatus, L. Watson 244, (2) 612; Drouet 204.— B. & H. 522. *f. 1198.*

Corvo (1066, 1067, 1068). Flores. Fayal (*Brown*, 285, 286). Pico. Graciosa (1069, 1070). Terceira (1071, 1072). San Miguel (1073; *Carreiro*, 452, *a*). Sta. Maria (1073, *a*).

***H. rigidus**, Hochst. in Seubert 17. *pl. 1;* Watson 244, (2) 612; Drouet 204; Seub. & Hochst. 10. *H. mollis*, Seubert 18; ?Drouet 204; Watson (2) 612, (4) 244.

Corvo (1074, 1075). Flores (1076, 1077, 1078, 1079). Fayal (*Brown*, 287). Pico. San Miguel (1080; *Carreiro*, 743).

*Aira caryophyllea, L. Watson 243, (2) 612; Drouet 205; Seubert 19; Seub. & Hochst. 10.— B. & H. 520. *f. 1193.*

Flores. Fayal. Pico (*Brown*, 304). Terceira (1081; *Sampaio*). San Miguel (*Carreiro*, 57). Sta. Maria (1081, *a*, 1090, *a*).

The last-named number bears some resemblance to *A. Cupaniana*, Guss., but as a rule both flowers of a spikelet are awned, whereas in *A. Cupaniana* one should be awnless.

*A. praecox, L.— B. & H. 520. *f. 1192.*

Sta. Maria (1081, *b*).

***Deschampsia foliosa,** Hack. Cat. Rais. Gram. Portug. (1880), 33. *D. argentea*, Watson 243, (2) 612; Drouet 206.— *Plate 57.*

Corvo (1082). Flores (1083, 1084, 1085). Terceira (1086). San Miguel (1087; *Carreiro*, 66).

Quite distinct from the Madeiran *D. argentea*, which, for comparison is figured on *Plate 58.*

*†Avena barbata, Brot. *A. hirsuta*, Watson 245, (2) 612; Drouet 206; Seubert 19; Seub. & Hochst. 10.— Willk. & Lange, Prodr. Fl. Hisp. **1**: 68.— Barker-Webb & Berthel. Hist. Nat. Iles Canar. *pl. 247.*

Corvo (1089, 1090). Fayal (*Brown*, 290). Pico (*Brown*, 305?). Terceira (*Sampaio*). San Miguel. Sta. Maria (1090, *a*, 1090, *b*).

*†Arrhenatherum avenaceum, Pal. Beauv. Watson 244. *Avena elatior*, Watson (2) 612. *A. elatior*, *β. bulbosa*, and *γ. precatoria*, Drouet 206. *?A. brevis*, Watson 244, (2) 613. *?A. brevis*, var. *uniflora*, Seubert 19; Drouet 206; Seub. & Hochst. 10. *?Arundo brevis*, Watson (3) 396.— B. & H. 522. *f. 1197.*

Flores (1091). Fayal (*Brown*, 288, 289). Terceira (1092; *Sampaio*). San Miguel (1093; *Carreiro*).

The moniliform bulbous bases render the plant a bad weed in gardens.— Brown, 288 has the nodes glabrous, but all of the other specimens I have seen belong to the form with pubescent nodes.

*Gaudinia fragilis, Beauv.— Corbière, 663.— Rchb. **1.** *pl. 90.*

San Jorge (1088). Sta. Maria (1088, *a*).

G. GEMINIFLORA, Gay. Watson 250, (2) 612. *Avena geminiflora*, Seubert 19; Drouet 206; Seub. & Hochst. 10.

Fayal. San Miguel.— Not recently collected, and possibly referring to the preceding.

*CYNODON DACTYLON, Pers. Watson 240, (2) 611; Drouet 205; Seubert 19; Seub. & Hochst. 10.— B. & H. 523. *f. 1200.*

Fayal (*Brown*, 278). Terceira (1094, 1095, 1096). San Miguel. Sta. Maria (1096, *a*).

*†ELEUSINE INDICA, Gaertn. Watson 240, (2) 611; Drouet 205; Seub. & Hochst. 10. — Gray, 656. *pl. 9.*

Flores (1097, 1098). Fayal. Pico (*Brown*, 279). Terceira (1100). San Miguel (1101; *Carreiro*).

*E. BARCINONENSIS, Costa. *E. Indica*, var. *brachystachya*, Watson 240. *E. Indica*, *β*. Seubert 19. — Willk. & Lange, Prodr. Fl. Hisp. **1**: 46.— *Plate 59.*

San Jorge (1099, at Calhete). San Miguel. Sta. Maria (1101, *a*).

*ARUNDO DONAX, L. Watson 240, (2) 613; Drouet 515; Seubert 19; Seub. & Hochst. 10.— Parlatore, Fl. Ital. **1**: 217.— Host, Gram. Austr. **4**. *pl. 88.*

Corvo. Flores. Fayal (*Brown*, 297). Pico. *Terceira. San Miguel. Sta. Maria.*

Perhaps always escaped, but thoroughly established.

*TRIODIA DECUMBENS, Beauv. Watson 246. *Danthonia decumbens*, Drouet 206.— Parlatore, Fl. Ital. **1**: 297.— Host, Gram. Austr. **2**. *pl. 72* (under *Poa*).

San Miguel.— Not collected for many years.

*†ERAGROSTIS MAJOR, Host. *E. megastachya*, Drouet 207.— Gray, 660.— Rchb. **1**. *pl. 164.*

Terceira.

*†E. MINOR, Host. *E. poaeoides*, Drouet 207. *?Poa Eragrostis*, Watson 245, (2) 613. — Gray, 660.— Rchb. **1**. *pl. 164.*

Pico. Terceira. San Miguel.— Not recently collected.

*KOELERIA PHLEOIDES, Pers. Watson 245, (2) 612; Drouet 207; Seubert 20; Seub. & Hochst. 10.— Parlatore, Fl. Ital. **1**: 330.— Host, Gram. Austr. **3**. *pl. 21.*

Fayal. San Jorge (1102). Terceira (*Sampaio*). San Miguel (*Carreiro*, 93).

*Briza maxima, L. Watson 246, (2) 613; Drouet 207; Seubert 19; Seub. & Hochst. 10. — Rchb. 1. *pl. 165*.

Corvo (1103, 1104). Flores (1105). Fayal (*Brown*, 291, 292). Pico. *Graciosa*. *Terceira*. San Miguel (*Carreiro*). Sta. Maria (1105, *a*).

*B. minor, L. Watson 246, (2) 613; Drouet 207; Seubert 19; Seub. & Hochst. 10.— B. & H. 535. *f. 1231*.

Corvo (1106, 1107, 1108). Flores (1109). Fayal. Pico (*Brown*, 303). Terceira (1110, 1111). San Miguel (1112). *Carreiro*). Sta. Maria (1112, *a*, 1112 *b*).

*Cynosurus echinatus, L. Watson 247, (2) 612; Drouet 207; Seubert 20; Seub. & Hochst. 10.— B. & H. 534. *f. 1229*.

Fayal. Pico. Terceira. San Miguel (1117). Sta. Maria 1117, *a*).

*C. cristatus, L. Watson 247; Drouet 207.— B. & H. 534. *f. 1228*.

Pico. San Miguel (*Carreiro*, 208). Sta. Maria.

*Poa annua, L. Watson 245, (2) 613; Drouet 206.— B. & H. 538. *f. 1239*.

Flores (1113). Fayal (*Brown*, 302). Graciosa (1114). Terceira (1115). San Miguel (*Carreiro*). Sta. Maria (1115, *a*, 1115, *b*).

*P. trivialis, L. Watson 245, (2) 613; Drouet 206.— B. & H. 539. *f. 1242*.

Corvo (1116). Flores. Fayal. Pico (*Brown*, 307). San Miguel. Sta. Maria (1116, *a*).

*P. pratensis, L. Watson 245; Drouet 206. — B. & H. 539. *f. 1241*.

Fayal.— Perhaps referring to the preceding.

*Festuca rigida, Kunth. *Poa rigida*, Watson 245, (2) 613; Drouet 206; Seubert 19; Seub. & Hochst. 10.— B. & H. 538. *f. 1237*.

Fayal. Terceira (1116, *a; Sampaio*). San Miguel.

*F. BROMOIDES, L. Watson 247, (2) 613; Drouet 207; Seubert 20; Seub. & Hochst. 10.—Corbière, 643 (as *Vulpia membranacea*).—Rchb. 1. *pl. 130.*

Fayal. Pico. Terceira. San Miguel.

*F. MYUROS, L.—Corbière, 644 (as *Vulpia*).—Rchb. 1. *pl. 130.*

Terceira (*Sampaio*).

*F. SCIUROIDES, Roth.—Corbière, 644 (as *Vulpia*).—Rchb. 1. *pl. 130.*

San Miguel (1118; *Carreiro*, 59). Sta. Maria (1118, *a*, 1118, *b*, 1118, *c*).

Although this is joined to *F. Myuros* in the Index Kewensis, and both are closely related to *F. bromoides*, under which all of the Azorean specimens of this group have been reported heretofore, it has seemed to me best to separate them on what appear to be good characters, leaving the exact distribution of *F. bromoides* for further study.

*F. JUBATA, Lowe. Watson 247, (2) 613; Drouet 207. *F. glauca*, β. *longearistata*, Hochst. in Seubert 20; Seub. & Hochst. 10.—*Plate 60.*

Corvo? Fayal. Pico. San Miguel (*Carreiro*, 10, 64, 221).

*F. **petraea**, Guthn. in Seubert 20; Watson 248, (2) 613; Drouet 207; Seub. & Hochst. 10.—*Plate 61.*

Corvo (1119). Flores (1120, 1121). Terceira. San Miguel (1122; *Carreiro*, 24). Sta. Maria (1122, *a*).

*F. ELATIOR, L. Watson 248, (3) 383; Drouet 207.—B. & H. 532. *f. 1223.*

San Miguel (1123). Sta. Maria.

*DEMAZERIA LOLIACEA, Nym. *Poa loliacea*, Watson 246, (2) 613, (3) 396; Drouet 206; Seubert 19; Seub. & Hochst. 10.—B. & H. 538. *f. 1238.*

Fayal. Terceira. San Miguel (*Carreiro*, 94).

*†BROMUS MADRITENSIS, L. Watson 248, (2) 613; Drouet 208; Seubert 20.—B. & H. 530. *f. 1219.*

Flores (1131, 1132). Fayal (*Brown*, 293). San Miguel (*Carreiro*, 123).

*B. RUBENS, L. Watson 248, (2) 613; Drouet 208; Seubert 20; Seub. & Hochst. 10.— Parlatore, Fl. Ital. 1: 410.— Sibth. Fl. Graeca. 1. *pl. 83.*

Terceira. San Miguel.

*B. RIGIDIS, Roth. *B. maximus*, Watson 248; Drouet 208.— B. & H. 530. *f. 1218.*

Terceira (*Sampaio*). San Miguel (*Carreiro*, 45).

*B. MOLLIS, L. Watson 248, (2) 613, (3) 393; Drouet 208.— B. & H. 531.— Rchb. 1. *pl. 143.*

Pico. Fayal. San Miguel.— Not recently collected.

*B. unioloides, HBK.— Vasey, Grasses of the South, 32. *pl. 12.— Plate 62.*

Graciosa (1129). Terceira (1130).— A South American introduction.

*BRACHYPODIUM SYLVATICUM, Beauv. Watson 249, (2) 613, (3) 393; Drouet 208.— B. & H. 529. *f. 1213.*

Flores (1124). Fayal. Pico (*Brown*, 300). San Jorge (1125). Graciosa (1126). Terceira. San Miguel (1127, 1128; *Carreiro*). Sta. Maria (1128, *a*).

*B. DISTACHYUM, Beauv. Watson 249, (2) 613. *Triticum ciliatum*, Drouet 208; Seubert 20; Seub. & Hochst. 10.— Rchb. 1. *pl. 129.*

Pico. Terceira. San Miguel. Sta. Maria.

LOLIUM REMOTUM, Hoffm. *L. arvense*, Drouet 208; Watson 250.—Rchb. 1. *pl. 110.*

Sta. Maria.—Perhaps referring to a few-flowered form of the next.

*LOLIUM GAUDINI, Parl. *L. multiflorum*, Watson 250, (2) 613; Drouet 208; Seubert 20; Seub. & Hochst. 10. ?*L. Italicum*, Drouet 208.— Parlatore, Fl. Ital. 1: 532.— Rchb. 1. *pl. 111.*

Flores (1137, 1142, 1143). Fayal. Pico. Graciosa (1139, 1140). Terceira (*Sampaio*). Sta. Maria (1140, *a*, 1140, *b*, 1140, *c*).

*L. PERENNE, L. Watson 249, (3) 383; Drouet 208; Seub. & Hochst. 10.— B. & H. 528. *f. 1211.*

Corvo (1138). Flores. Fayal (*Brown*, 294). Pico. Terceira (1141). San Miguel (*Carreiro*, 46, 314, *a*).

*†L. TEMULENTUM, L.— B. & H. 528. *f. 1212.*

San Miguel (*Carreiro*, 131, at Pico dos Bodes).

AGROPYRON REPENS, Beauv. *Triticum repens,* Watson 249, (2) 613; Drouet 208; Seubert 20; Seub. & Hochst. 10.— B. & H. 527. *f. 1209.*

Indefinitely reported by Seubert. Perhaps referring to one of the preceding?

*NARDUS STRICTA, L. Watson 250; Drouet 208.— B. & H. 524. *f. 1203.*

San Miguel (*Carreiro*, 746).

*†HORDEUM MURINUM, L. Watson 249, (2) 613; Drouet 208; Seubert 20; Seub. & Hochst. 10.— B. & H. 526, *f. 1207.*

Flores (1133). Fayal (*Brown*, 295, 296). San Jorge (1134). Graciosa (1135, 1136). Terceira (*Sampaio*). San Miguel (*Carreiro*). Sta. Maria (1136, *a*).

CONIFERAE.

***Juniperus brevifolia,** Antoine, Kupressineengattungen. 16. *pl. 20–22;* Watson 224. *J. Oxycedrus*, var. *brevifolia*, Hochst. in Seubert 26; Drouet 196. *J. Oxycedrus*, Seub. & Hochst.10; Watson (2) 606, (3) 392. *J.* sp., Watson (1) 7, 408.

Corvo (1137, *a*). Flores (1138, *a*, 1139, *a*). Fayal (*Brown*, 309, 310). Pico. San Miguel (1140, *a*; *Carreiro*).

Large logs, apparently of this species, occur deeply buried under secondary volcanic debris in the Grotto do Enferno of the great crater known as Sete Cidades.

J. SABINA, L.—Rchb. **11.** *pl. 536.*

San Miguel (*Carreiro*, at Agua do Pao,— perhaps not even truly escaped).

PINUS PINEA, L. Seubert 26; Drouet 197; Watson 225, (2) 606; Seub. & Hochst. 10.— Rchb. **11.** *pl. 528-9.*

Commonly cultivated, and perhaps spreading a little in several islands.

TAXUS BACCATA, L. Seubert 26; Drouet 196; Watson 225, (2) 606; Seub. & Hochst. 10.— Rchb. **11.** *pl. 538.*

Formerly occurred in workable size on Corvo and Flores, whence it was exported as a source of royal revenue. Now seemingly exterminated.

Pteridophytes.

Filices.

*Dicksonia Culcita, L'Her. Watson 250, (2) 614; Drouet 212; Seubert 16; Seubert & Hochst. 9; Milde 173.—Hook. & Bak. 51.—Lowe, Ferns. 8. *pl. 39.*

Flores. Fayal. Pico (*Brown*, 317). Terceira (1141, 1142). San Miguel (1143; *Carreiro*).

*Hymenophyllum Tunbridgense, Sm. Watson 250, (2) 614; Drouet 113; Seubert 16; Seub. & Hochst. 9; Milde 12.— B. & H. 568. *f. 1309.*

Flores (1288, 1289, 1290). Fayal. Pico. Terceira (1291, 1292, 1293). San Miguel (1294, 1295, 1296; *Carreiro*, 20; *Machado*, 2).

*H. unilaterale, Bory. Watson 251; Milde 13. *H. Wilsoni*, Watson (2) 614; Drouet 213.—B. & H. 569. *f. 1310.*

Corvo. Flores. Terceira. San Miguel.

*Trichomanes speciosum, Willd. Watson 251, (2) 614; Drouet 213; Seubert 16; Seub. & Hochst. 9; Milde 11. *T. Hibernicum*, Seub. & Hochst. 9.— B. & H. 568. *f. 1308.*

Corvo (1144). Flores (1145). Fayal. Pico. Terceira (1146). San Miguel (1147).

Davallia Canariensis, Sm. Watson 251. *Trichomanes Canariense*, Drouet 213.—Hook. & Bak. 97.— Hook. Sp. Fil. 1: 169. *pl. 56. A.*

Evidently an error, the specimens perhaps from Madeira.

*Cystopteris fragilis, Bernh. Watson 251, (2) 613; Drouet 212; Seubert 16. *C. Azorica*, Fée. *C. fragilis*, var. *Azorica*, Moore, Ind. Fil. 282. *Aspidium fragile*, Seub. & Hochst. 9. *Cystea fragilis*, Watson (1) 129.—B. & H. 567. *f. 1305.*

Corvo. Flores (1148). Fayal (*Brown*, 328). Pico. Terceira. San Miguel (1149, 1150).—The variety *Canariensis*, Milde 152.

*Adiantum Capillus-Veneris, L. Watson 251, (2) 614, (3) 396; Drouet 210; Seubert 15; Milde 30. *A. Afri-*

canum, Seub. & Hochst. 9. *A. Maderense*, Seub. & Hochst. 9.— B. & H. 566. *f. 1304.*

Fayal (*Brown*, 318 — perhaps escaped). Terceira (1151, 1152). San Miguel (1153; *Brown*, 319; *Carreiro*). Sta. Maria (1153, *a*).

*PTERIS ARGUTA, Ait. Watson 251, (2) 614; Drouet 211; Seubert 15; Seub. & Hochst. 9; Milde 44.— Hook. & Bak. 160.— Lowe, Ferns. 3. *pl. 41.*

Flores (1154, 1155, 1156). Fayal (*Brown*, 332, 333). Pico. Terceira (*Abreu*). San Miguel (1157, 1158).

P. TREMULA, R. Br.— Hook. & Bak. 161.— Hook. Sp. Fil. 2: 174. *pl. 120.*

San Miguel (1159).— Escaping in gardens.

P. CRETICA, L.— Hook. & Bak. 154.

San Miguel.— Subspontaneous in gardens.

P. SERRULATA, L. f.— Hook. & Bak. 155.

San Miguel.— Subspontaneous in gardens.

*EUPTERIS AQUILINA, Newman. *Pteris aquilina*, Watson 252, (2) 614; Drouet 210; Seubert 15; Seub. & Hochst. 9.— B. & H. 566. *f. 1303.*

Corvo (1160). Flores (1161 — a diseased ? form with very narrow pinnules; the usual form also very common). Fayal (*Brown*, 334, 335). Pico. *Graciosa.* Terceira (1162). San Miguel (1163). *Sta. Maria.*

A sterile form with elongated flaccid fronds and remote pinnae cut nearly to the rachis into round-oblong undulate segments, probably belonging here, occurs in damp dark ravines on Flores (1299), Pico (*Brown*), and Terceira (*Sampaio*).— *Plate 63.*

*LOMARIA SPICANT, Desv. Watson 252. *Blechnum Spicant*, Drouet 211; Milde 47. *B. boreale*, Watson (2) 614; Drouet 211; Seubert 15; Seub. & Hochst. 9.— B. & H. 565. *f. 1302.*

Corvo (1164). Flores (1165). Fayal (*Brown*, 327). Pico. Terceira (1166). San Miguel (1167, 1168, 1169, 1170; *Carreiro*). Sta. Maria (1170, *a*).

*WOODWARDIA RADICANS, Sm. Watson 252, (2) 614; Drouet 212; Seubert 16; Seub. & Hochst. 9; Milde 48.— Hook. & Bak. 188.— Lowe, Brit. Fil. 4. *pl. 44.*

Flores (1171). Fayal (*Brown*, 329). Pico (*Brown*, 330). Terceira (1172). San Miguel (*Brown*, 331; *Carreiro*). Sta. Maria (1172, *a*).

*Asplenium Hemionitis, L. *A. palmatum*, Watson 252, (2) 613; Drouet 211; Seubert 15; Seub. & Hochst. 9; Milde 59.— Hook. & Bak. 194.— Bot. Mag. **82**. *pl. 4911.*

Corvo (1173, 1174). Flores (1175, 1176, 1177). Fayal (*Brown*, 336, 337). Pico. Terceira (1178; *Abreu*). San Miguel.

*A. Trichomanes, L. Seub. & Hochst. 9. *A. anceps*, Watson 252, (2) 614; Drouet 211; Seubert 15; Seub. & Hochst. 9.— B. & H. 563. *f. 1294.*

Corvo (1179, 1180). Flores (1181). Fayal (*Brown*, 338, 339, 340). Pico (*Brown*, 341). Graciosa (1182). Terceira (1183, 1184). San Miguel (1185, 1186, 1187). Sta. Maria (1187, *a*).—The variety *anceps*, forma *Azorica* of Milde 64.

*A. monanthemum, L. Watson 253, (2) 614; Drouet 211; Seubert 15; Seub. & Hochst. 9; Milde 67.— Hook. & Bak. 197.— Lowe, Brit. Fil. **5**. *pl. 1.*

Flores. Fayal. Pico. Terceira (1188). San Miguel (1189, 1190; *Brown*, 342).

*A. marinum, L. Watson 253, (2) 614; Drouet 211; Seubert 15; Seub. & Hochst. 9; Milde 70.— B. & H. 563. *f. 1293.*

Corvo (1191, 1192). Flores (1193). Fayal (*Brown*, 343). Pico (*Brown*, 344). Graciosa (1194, 1195). Terceira (1196; *Sampaio*). San Miguel (1197; *Carreiro*). Sta. Maria (1197, *a*, 1197, *b*). — The forma *subpinnata* of Moore.

*A. lanceolatum, Huds. Watson 253, (2) 614; Drouet 211; Milde 72.— B. & H. 563. *f. 1292.*

Corvo (1278, 1279, 1280). Flores. Fayal (*Brown*, 347, 349?). San Jorge (1281). Graciosa (1285, *a*?). San Miguel.— The var. *microdon*, Moore.

*A. ADIANTUM-NIGRUM, L. Watson 253, (2) 614; Drouet 211; Seubert 15; Seub. & Hochst. 9; Milde 86.— B. & H. 563. *f. 1296.*

Corvo (1277). Flores. Fayal (*Brown*, 345, 346). Pico. San Jorge (1282, 1283). Graciosa (1284, 1285). Terceira (1286). San Miguel (1287, 1287, *a*). Sta. Maria (1287, *b*, 1287, *c*). The form *nigrum*, *obtusum*, of Milde, *l. c.*

Nos. 1282, 1285, 1285, *a*, 1286, and 1287, *a*, are variously intermediate between this and the preceding species.

*A. FILIX-FOEMINA, Bernh. Drouet 211. *Athyrium Filix-foemina*, Watson 254, (2) 614; Milde 51. *A. Azoricum*, Fée. *Allantodia axillaris*, and *β. Azorica*, Hochst. in Seubert 16; Seub. & Hochst. 9; Watson (2) 614, (3) 396; Drouet 211.— B. & H. 562. *f. 1290.*

Corvo (1264, 1265). Flores (1266, 1268, 1269, 1270). Fayal (*Brown*, 350, 351, 352, 353). Pico (*Brown*, 354). Terceira (1271; *Sampaio*). San Miguel (1273, 1275, 1276; *Brown*, 355). Sta. Maria (1276, *a*).— The varieties *dissectum*, Moore and *axillare*, Barker-Webb & Berth.

*A. UMBROSUM, J. Sm. *Athyrium umbrosum*, Watson 254; Milde 56. *Allantodia umbrosa*, Drouet 211; Seubert 15; Seub. & Hochst. 9; Watson (2) 614.— Hook. & Bak. 229.

Flores (1267). Pico (*Brown*, 356). San Miguel (1274). Sta. Maria (1274, *a*).

*SCOLOPENDRIUM VULGARE, Sm. Watson 254, (2) 613; Milde 90. *S. officinarum*, Drouet 212; Seubert 16; Seub. & Hochst. 9.— B. & H. 565. *f. 1300.*

Flores (1198, 1199). Fayal (*Brown*, 320). Terceira (1200, 1201, 1202). San Miguel (1203). Sta. Maria (1203, *a*).

*ASPIDIUM ACULEATUM, Sw. var. ANGULARE, Willd. Milde 108. *A. angulare*, Watson 254, (2) 614; Drouet 212; Seubert 16; Seub. & Hochst. 9. *A. aculeatum*, Drouet 212.— Hook. & Bak. 252.

Flores. Fayal (*Brown*, 357, 358, 359). Graciosa (1204). Terceira (1205). San Miguel (1206, 1207, 1208; *Carreiro*). Sta. Maria (1208, *a*, 1208, *b*).

*A. FILIX-MAS, Sw. Watson 255. *Polystichum Filix-mas*, Drouet 212.— B. & H. 560. *f. 1285.*

Flores ? Fayal ? San Miguel (1209).

*A. SPINULOSUM, Sw. var. DILATATUM, Hook. Milde 141. *A. dilatatum*, Watson 255. *Polystichum dilatatum*, Drouet 212. *?Lastraea multiflora*, Watson (3) 383; Drouet 210. *Nephrodium Foenisecii*, Seub. & Hochst. 9; Seubert 16, *fide* Watson 256, (2) 614, (3) 393; Drouet 212.— B. & H. 561.

Flores ? Fayal ? San Miguel (1210). Sta. Maria (1210, *a*, 1210, *b*).

*A. AEMULUM, Sw. Watson 256; Milde 141. *? Polystichum tanacetifolium*, Drouet 212.— Hook. & Bak. 279 (as *Nephrodium*).

Corvo (1211, 1297). Flores (1212, 1298). Fayal (*Brown*, 360). Pico. Terceira (1213, 1214). San Miguel (1215, 1216; *Carreiro*). Sta. Maria (1216, *a*).

*A. MOLLE, Sw. Watson 256; Milde 111. *Nephrodium molle*, Drouet 212; Seubert 16; Watson (2) 614.— Hook. & Bak. 293.

Flores (1217, 1228). Fayal (*Brown*, 361, 362). San Miguel (1218, 1219; *Brown*, 363). Sta. Maria (1219, *a*).

*POLYPODIUM VULGARE, L. Watson 256, (2) 613; Drouet 210; Seubert 15; Seub. & Hochst. 9; Milde 19.— B. & H. 556. *f. 1276.*

Corvo (1220). Flores (1221). Fayal (*Brown*, 321, 322). Pico (*Brown*, 323). Terceira (1222; *Abreu*). San Miguel (1223). Sta. Maria (1223, *a*).

Referred to the variety *serrulatum*, Willd. by Seubert and Drouet, and also, in part, by Milde to var. *Teneriffae* and var. *Cambricum*.

*GYMNOGRAMME TOTTA, Schl. *G. Lowei*, Watson 256, (3) 383; Drouet 210. *Phegopteris Totta*, Milde 102. — Hook. & Bak. 376.— Hook. & Grev. Icon. *pl. 89.*

Fayal. San Miguel (1224, 1225, 1226, 1227).

*G. LEPTOPHYLLA, Desv. Watson 257; Milde 21. *Grammitis leptophylla*, Drouet 210; Seubert 15; Seub. & Hochst. 9; Watson (2) 613.— Hook. & Bak. 383.— Hook. Brit. Fil. *pl. 1.*

Corvo (1229). Fayal (*Brown*, 348). Terceira (1230). San Miguel (*Miss Brown*). Sta. Maria.

*ACROSTICHUM SQUAMOSUM, Sw. Watson 257, (2) 614; Drouet 210; Seubert 14; Seub. & Hochst. 9; Milde 14. — Hook. & Bak. 411. — Hook. & Grev. *pl. 235.*

Flores (1231). Fayal. Pico. Terceira (1232). San Miguel (1233, 1234; *Carreiro*, 877).

*OSMUNDA REGALIS, L. Watson 257, (2) 614; Drouet 213; Seubert 16; Seub. & Hochst. 9; Milde 176, 178.— B. & H. 556. *f. 1275.*

Corvo (1235, 1236). Flores (1237). Fayal (*Brown*, 324, 325). Terceira (1238; *Abreu*). San Miguel (1239; *Brown*, 326).— According to Milde, the varieties *Plumieri* and *interrupta*.

OPHIOGLOSSACEAE.

*OPHIOGLOSSUM VULGATUM, L. Watson 257, (2) 614, (3) 394; Drouet 213.— B. & H. 555. *f. 1273.*

Flores. Terceira.

*O. VULGATUM, var. POLYPHYLLUM, Milde 189. *O. Lusitanicum*, Watson 257; Seub. & Hochst. 9. *O. polyphyllum*, Seubert 17. *O. Azoricum*, Presl, Suppl. Tent. Pteridogr. 309.— B. & H. 555.— The variety *cuspidatum* of Milde.— *Plate 64.*

Terceira, San Miguel (*Miss Brown*).

EQUISETACEAE.

*EQUISETUM TELMATEIA, Ehrh. Drouet 209. *E. maximum*, Watson 260. *E. fluviatile*, Watson (1) 129, (2) 615; Seubert 14.— B. & H. 550. *f. 1263.*

Flores (1259). Fayal. San Miguel (1260).

*E. TELMATEIA, forma SEROTINA, A. Br. Milde 220. — Fl. Danica. 9. *pl. 1469*.

Flores (1257, 1258, at Coste).

*E. RAMOSISSIMUM, Desf. Milde 238. *E. incanum*, Watson 261; Drouet 209. *E. limosum*, Watson (3) 383.— Milde, Mon. Equis. *pl. 24*.

San Miguel (*Brown*, 400, at the Furnas).

LYCOPODIACEAE.

*LYCOPODIUM CERNUUM, L. Watson 258, (2) 615; Drouet 209; Seubert 17; Seub. & Hochst. 9; Milde 254.— Baker, Fern Allies. 23.— Descourt. Fl. Ant. 4. *pl. 249*.

Pico (*Brown*, 311). Terceira (1240, at Furna do Enxofre; *Abreu*). San Miguel (1241, 1242, 1243, 1244; *Brown*, 312, 313; *Carreiro*, 28).

*L. COMPLANATUM, L. Watson 258, (3) 382; Drouet 209.—Luerssen, Farnpflanzen Deutschl. 822.— Sturm. 2. *pl. 11*.

Flores (1245, on the mountains above Lagens). San Miguel.

L. SELAGO, L. Watson 259, (1) 400, (2) 614; Drouet 209.— B. & H. 546. *f. 1258*.

Pico. Terceira.— Perhaps doubtful as separate from the next.

*L. SELAGO, var. SUBERECTUM, Bak. *L. suberectum*, Watson 259, (1) 129, (2) 614; Drouet 209; Seub. & Hochst. 9.— *L. Selago*, var. *spinulosum*, Seubert 17; Milde 252.— *Plate 65*.

Flores (1246, 1247). Fayal. Pico. Terceira. San Miguel (1248, 1249, 1250, 1251; *Carreiro*, 29).

ISOETACEAE.

Isoetes Azorica, Durieu in Milde Fil. Eur. et Atl. 278; Watson 260; Baker, Fern Allies 125. *I. lacustris*, Watson (2) 615; Drouet 209.—*Plate 66*.

Corvo (1261, in the Caldeira — the original local-

ity). Flores (1262, Lagoa Raza, where it was detected by my son Frank; 1263, Caldeira da Lomba).

Mr. A. A. Eaton, who has examined my specimens, finds many stomata near the leaf tips, and the species in fact appears amphibious.

Selaginellaceae.

*Selaginella Kraussiana, A. Br. Watson 259; Milde 272. *S. denticulata*, Drouet 210; Seubert 17. *Lycopodium denticulatum*, Seub. & Hochst. 9; Watson (2) 614.— Baker, Fern Allies, 65.

Corvo (1252). Flores (1253). Fayal (*Brown*, 314, 315, 316). Pico. Terceira (1254; *Abreu*). San Miguel (1255, 1256; *Machado*, 14). Sta. Maria (1256, *a*).

*S. Azorica, Baker, Journ. of Bot. 21: 210; Fern Allies 50.

"Mountains of the Azores, *Arruda Furtado*."

Bryophytes.

(musci.)

Bryales.*

Hylocomium Berthelotianum, Geheeb. Cardot 71. *Ctenidium Berthelotianum*, Mitten 307. *Hypnum Hochstetteri*, Schimper in Seubert 14; Drouet 215.

Fayal (*Brown*, 397). San Miguel (*Machado*, 12). Sta. Maria (1391, *a*).

H. splendens, Br. & Sch. Cardot 71. *?Hypnum proliferum*, Drouet 215.

San Miguel (1391).

H. squarrosum, Br. & Sch. Mitten 308; Cardot 71.

Fayal.

Hypnum cuspidatum, L. Cardot 71. *Amblystegium cuspidatum*, Mitten 312.

San Miguel (*Machado*, 4, 7, 9, 29; *Brown*, 393, *a*). Sta. Maria.

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* Determinations by M. J. Cardot, whose paper on the Mosses of the Azores appears elsewhere in the present Garden Report (p. 51).

H. PURUM, L. Mitten 310; Cardot 70.
Flores (1394). Sta. Maria (1394, *a*).

H. CANARIENSE, Jaeg. & Sauerb. Cardot 70. *Stereodon Canariense*, Mitten 308.
Flores (1392). Fayal (*Brown*, 398) Pico (*Brown*, 376). San Miguel (*Brown*, 391).

H. CUPRESSIFORME, L. Cardot 70. *Stereodon cupressiforme*, Mitten 307.
Corvo (1389). Fayal. Graciosa (Blanchy). San Miguel (*Brown* 392, 394; *Machado*).

H. CUPRESSIFORME, var. RESUPINATUM, Sch. Cardot 70.
Flores (1388). Fayal (*Brown*, 399). Graciosa (Blanchy).

Sciaromium Renauldi, Cardot, Mosses of Azores 69. *pl. 10.*
Pico (*Brown*, 377).

S. SPINOSUM, Mitten 313; Cardot 69. *Leskea spinosa*, Mitten (2) 7.
"Azores" (Hunt).— Not recently collected.

S. PROLIXUM, Jaeg. & Sauerb. Mitten 313, Cardot 69.
Fayal.

PLAGIOTHECIUM SYLVATICUM, Br. & Sch. Cardot 69.
San Miguel (*Machado*, 16).

THAMNIUM ALOPECURUM, Br. & Sch. Cardot 69. *Hypnum alopecurum*, Seubert 14; Watson (2) 616; Drouet, 215.
San Miguel (1346; *Carreiro*, 17; *Brown*, 389, 390; *Machado*, 10).

RHYNCHOSTEGIUM RUSCIFORME, Br. & Sch. Cardot 69.
Flores (1395). San Miguel (1345, 1346, *a*, 1395, *a*).

R. CONFERTUM, Br. & Sch. Mitten 309; Cardot 69.
Sta. Maria.

EURHYNCHIUM STOKESII, Br. & Sch. Cardot 68.
Sta. Maria (1346, *b*).

E. PRAELONGUM, Br. & Sch. Cardot 68. *Hypnum praelongum*, Mitten 310; Drouet 215.
Pico (*Brown*, 385). San Miguel (1369). Sta. Maria 1369, *a*).

E. PRAELONGUM, var. ATROVIRENS, Br. & Sch. Cardot 68.
Hypnum Swartzii, Mitten 310.
Sta. Maria (1369, *b*).

E. MERIDIONALE, De Not. Cardot 68. *Hypnum longirostre*, var. *Duriaei*, Mitten 310.
"Azores" (Godman).

E. CIRCINATUM, Br. & Sch. Cardot 68.
Flores (1390).

SCLEROPODIUM ILLECEBRUM, Br. & Sch. Cardot 68. *Hypnum illecebra*, Mitten 310.
"Azores" (Godman).

MYURIUM HEBRIDARUM, Sch. Mitten 306; Cardot 67.
Flores (1370, 1371, 1372). Fayal (*Brown*, 397, *a*). San Miguel (*Machado*, 13). Sta. Maria (1372, *a*, 1372, *b*).

BRACHYTHECIUM SALEBROSUM, Br. & Sch. Cardot 67.
San Miguel (*Brown*, 396). Sta. Maria (1369, *c*).

THUIDIUM TAMARISCINUM, Br. & Sch. Mitten 313; Cardot 67.
San Miguel (*Brown*, 395; *Machado*, 30).

LEPIDOPILUM FONTANUM, Mitten 305; Cardot 67. *Bartramia fontana*, Watson (2) 616.
Flores.

PTEROGONIUM GRACILE, Sw. Cardot 67.
Graciosa (Blanchy).

Astrodontium Treleasei, Cardot, Mosses of Azores. 66. *pl. 9*.
Graciosa (*Brown*, 386). Terceira (1352). Sta. Maria (1352, *a*).

A. CANARIENSE, Schw. Mitten 304; Cardot 66.
San Miguel.

FONTINALIS ANTIPYRETICA, L. Mitten 306; Watson (2) 616; Drouet 216; Cardot 66.
Flores.—Perhaps pertaining to the next.

F. antipyretica, var. **Azorica**, Cardot, Mosses of Azores. 66.
Flores (1367).

DIPHYSCIUM FOLIOSUM, Mohr. Watson (2) 616; Drouet 215.
Flores? — Not recently collected.

POLYTRICHUM PILIFERUM, Schreb. Seubert 14; Drouet 215; Cardot 65.
Graciosa (Blanchy). San Miguel (Drouet).

P. JUNIPERINUM, Willd. Cardot 65.
Graciosa (Blanchy).

P. FORMOSUM, Hedw. Watson (2) 616; Drouet 215; Cardot 65.
Flores (1354, 1362). San Miguel (1355,— forma *breviseta*).

P. COMMUNE, L. Mitten 315; Seubert 14; Drouet 215; Cardot 65; *? P. elatum*, Watson (2) 616.
Corvo (1356?; Prince of Monaco). Fayal (*Brown*, 381, 382). Terceira (1363). San Miguel (1357, 1358, 1359, 1360, 1361; *Carreiro*, 19; *Brown*, 387; *Machado*, 1).

P. COMMUNE, var. MINUS, Weis. Cardot 65.
Flores (1353).

P. COMMUNE, var. PERIGONIALE, Br. & Sch. Cardot 65.
San Miguel (*Carreiro*, 19, *a*). Sta. Maria (1353, *a*).

POGONATUM ALOIDES, Pal. Beauv. Cardot 65. *Polytrichum aloides*, Watson (2) 616; Drouet 215.
Flores (1364). San Miguel (1365, 1366; *Carreiro*, 18; *Machado*, 22).

ATRICHUM UNDULATUM, Pal. Beauv. Mitten 315; Cardot 64.
Flores. San Miguel (*Machado*, 23).

MNIUM UNDULATUM, Weis. Mitten 303; Cardot 63.
Flores. San Miguel (1349).

ANOMOBRYUM JULACEUM, Sch. Mitten 302; Cardot 63.
San Miguel.

Bryum pachyloma, Cardot, Mosses of Azores. 62. *pl.* 7.
Terceira (1381). San Miguel (*Machado*, 19).

B. CANARIENSE, Brid. Seubert 14; Drouet 215; Cardot 62.
Graciosa (*Brown* 380, *b*).

B. CAPILLARE, L. Mitten 303; Cardot 62. *B. platyloma*, Seubert 14; Drouet 215.
Flores (1378, 1379, 1380). San Miguel.

G. Azoricum, Cardot, Mosses of Azores. 60. *pl. 6.*
Corvo (1373). Flores (1374, 1375, 1376). Terceira (1377). Sta. Maria (1377, *a*).

G. POLYPHYLLUM, Mitten 294; Cardot 60. *Trichostomum polyphyllum*, Watson (2) 616; Drouet 214.
San Miguel.

RHACOMITRIUM LANUGINOSUM, Brid. Cardot 59. *Grimmia lanuginosa*, Mitten 293.
Fayal (*Brown*, 379, 380). Pico (Richard & Minelle). San Miguel.

R. HETEROSTICHUM, Brid. Cardot 59.
Pico (Richard & Minelle).

R. FASCICULARE, Brid. Cardot 59. *Trichostomum fasciculare*, Watson (2) 616; Drouet 214.
Pico (Richard & Minelle).

R. CANESCANS, Brid. *Trichostomum canescens*, Watson (2) 616; Drouet 214.
Azores.— Perhaps referring to one of the preceding. Mr. Watson, *l. c.*, also notes a *Trichostomum rigidifolium*, Tayl. ms., which I cannot further place. Also cited by Drouet 214.

GRIMMIA PULVINATA, Sm. Mitten 293; Cardot 59.
San Miguel.

G. sp.
Graciosa (*Brown*, 380, *c*, with *Bryum Canariense*; Blanchy). Sta. Maria (1393, *c*). — Sterile, but thought by M. Cardot, p. 59, to be probably undescribed.

BARBULA LAEVIPILA, Br. & Sch. Cardot 59. *Tortula laevipila*, Mitten 298.
San Miguel.

B. SQUARROSA, Brid. Cardot 59.
Sta. Maria (1393, *d*).

B. CONVOLUTA, Hedw. Cardot 59.
San Miguel (1385).

B. MARGINATA, Br. & Sch. Mitten 297; Cardot 58.
San Miguel (1384, 1386, 1387). Sta. Maria (1387, *a*, 1387, *b*).

DESMATODON NERVOSUS, Br. & Sch. Cardot 58.
Terceira (1382).

B. CAESPITICIUM, L. var. ATLANTICUM, Cardot, Mosses of Azores. 62.

Sta. Maria (1380, *a*, 1380, *b*, 1380, *c*).

B. ALPINUM, Huds. var. MERIDIONALE, Sch. Cardot 61.

Sta. Maria (1380, *d*).

B. ARGENTEUM, L. Mitten 302; Cardot 61.

San Miguel. Sta. Maria (1380, *e*).

WEBERA TOZERI, Sch. Cardot 63. *Epipterygium Tozeri*, Mitten 303.

San Miguel.

Breutelia Azorica, Cardot 64. *Bartramia Azorica*, Mitten 300.

Fayal. San Miguel (1368; *Machado*, 3, 4, *b*, 15, 17).

PHILONOTIS OBTUSATA, C. Müll. Cardot 64. *pl. 8.*

Flores (1350).

P. FONTANA, Brid. Cardot 64. *Bartramia fontana*, Watson (2) 616; Drouet, 215.

San Miguel (*Brown*, 393).

P. RIGIDA, Brid. Cardot 63. *Bartramia rigida*, Mitten 300. *Bryum rigidum*, Drouet 215.

Fayal. San Miguel (1347; *Machado*, 187). Sta. Maria (1347, *a*,— with *Campylopus polytrichoides*).

FUNARIA HYGROMETRICA, Sibth. Mitten 299; Cardot 61.

San Miguel.

ENTOSTHODON TEMPLETONI, Schw. Mitten 299; Seubert 14; Drouet 215; Cardot 61.

Fayal. San Miguel (*Machado*). Sta. Maria.

PHYSCOMITRIUM PYRIFORME, Brid. Mitten 299; Cardot 61.

Sta. Maria.

GLYPHOMITRIUM NIGRICANS, Mitten 294; Cardot 60. *Ptychomitrium nigricans*, Seubert 13; Drouet 214.

Graciosa (1393), San Miguel.

G. NIGRICANS, var. PULVINARE, Cardot 60. *G. pulvinare*, Mitten 294.

Sta. Maria (1393, *a*, 1393, *b*).

Trichostomum Azoricum, Cardot, Mosses of Azores. 58. *pl. 5.*

Terceira (1383).

T. mucronatulum, Cardot, Mosses of Azores. 57. *pl. 4.*

San Miguel (*Machado* 29, *b*).

T. FLAVOVIRENS, Bruch. Cardot 57. *Tortula flavo-virens*, Mitten 296.

San Miguel.

T. MUTABILE, Bruch. Cardot 57.

San Miguel (*Brown*, 388).

Hyophila Treleasei, Cardot, Mosses of Azores. 57. *pl. 3.*

Sta. Maria (1383, *a*).

CERATODON PURPUREUS, Brid. Cardot 56.

Graciosa (Blanchy). Sta. Maria (1383, *b*,— with *Campylopus polytrichoides*).

FISSIDENS ASPLENIOIDES, Hedw. Mitten 314; Drouet 216; Cardot 56.

San Miguel. Sta. Maria (1383, *c*).

F. SERRULATUS, Brid. Mitten 313; Cardot 56.

San Miguel (*Machado*, 11). Sta. Maria.

F. OSMUNDOIDES, Hedw. Seubert 14; Drouet 216.

Perhaps referring to one of the preceding.

LEUCOBRYUM JUNIPEROIDEUM, C. Müll. Mitten 294; Cardot 55.

"Azores" (Watson).—Not recently collected, and probably referring to the next.

L. GLAUCUM, Sch. Cardot 55.

Fayal (*Brown*, 384). Pico (*Brown*, 375).

L. GLAUCUM, var. ALBIDUM, Cardot 55.

San Miguel (1348). Sta. Maria (1348, *a*).

CAMPYLOPUS POLYTRICHOIDES, De Not. Cardot 55.

Pico (Richard & Minelle). San Jorge (*Brown*, 378). San Miguel (*Carreiro*, 16). Sta. Maria (1348, *b*, 1348, *c*).

C. **Azoricus**, Mitten, Godman's Azores, 292; Cardot 55.

San Miguel.

C. **setaceus**, Cardot, Mosses of Azores. 54. *pl. 2.*

Fayal (*Brown*, 380, *a*). San Miguel (*Machado*).

C. flexuosus, Brid. var. **Fayalensis**, Cardot, Mosses of Azores. 54. *pl. 1.*

Fayal (*Brown*, 383).

C. ATROVIRENS, DeNot. Drouet 215.

San Miguel.—Doubtful.

DICRANUM SCOTTIANUM, Turn. Mitten 292; Seubert 14; Drouet 214; Cardot 54.

"Azores" (Godman).

D. FLAGELLARE, Hedw. *D. strictum*, Drouet 214.

Flores. San Miguel.—Perhaps referring to the preceding?

RAMPHIDIUM PURPURATUM, Mitten 291; Cardot 54.

San Miguel.

WEISIA VIRIDULA, Hedw. Cardot 54. *W. controversa*, Mitten 294. *? Weissia*, sp., Drouet 214.

San Miguel (1351).

GYMNOSTOMUM CALCAREUM, Nees & Hornsch. Cardot 53. *Weissia calcarea*, Mitten 295. *G. tortile*, Seubert 13; Drouet 214. San Miguel.

ARCHIDIALES.

ARCHIDIUM ALTERNIFOLIUM, Sch. *A. phascoides*, Watson (2) 616; Drouet 214.

Flores ?—Not recently collected.

SPHAGNALES.*

Sphagnum nitidulum, Warnst. ined. Cardot 72.

Terceira (Daveau—Furna do Enxofre).

S. Godmanii, Warnst. Hedwigia. 1890: 189. *pl. 4*, 7; Cardot 72. *? S. acutifolium*, Mitten 316; Drouet 214.

Fayal?

S. subnitens, Russ. & Warnst. Verhandl. Bot. Ver. Brandenb. **30**: 115; Cardot 72.

Flores (1337, 1338, 1339, 1340, 1341, 1342). San Miguel (1343, 1344; *Machado*, 6, 8).

S. ACUTIFOLIUM, Russ. & Warnst. *l. c.* 112; Cardot 72.

Fayal. Terceira (1336).

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* Determinations by Dr. C. Warnstorf.

S. SQUARROSUM, Pers. Warnstorf, Hedwigia. 1890: 181; Cardot 72.

S. RIGIDUM, Sch. Cardot 72. *? S. compactum*, Mitten 316. San Miguel.

S. CENTRALE, Arn. & Jens. Cardot 72.
Corvo (1331). San Miguel (1334, 1335).

S. CYMBIFOLIUM, Hedw. Mitten 316; Seubert 13; Drouet 214; Cardot 71.
Fayal. San Miguel (*Machado*, 5).

S. CYMBIFOLIUM, var. GLAUCESCENS, Warnst. Cardot 71.
Terceira (1333).

S. CYMBIFOLIUM, var. PALLESCENS, Warnst. Cardot 71.
Flores (1332).

S. CYMBIFOLIUM, var. FUSCESCENS, Warnst. Cardot 72.
Terceira (Daveau). San Miguel (Daveau).

S. CYMBIFOLIUM, var. COMPACTUM, Schlieph. & Warnst. Cardot 72.
Terceira (Daveau).

(HEPATICAE).*

ANTHOCEROTACEAE.

ANTHOCEROS PUNCTATUS, L. Mitten 328; Drouet 217.—Gray, 726.
Flores (1312, 1313, 1314). Terceira (1315). San Miguel. Sta. Maria (1315, *a*, 1315, *b*).

JUNGERMANNIACEAE.

FRULLANIA TENERIFFAE, Web. Mitten 324.
"Azores" (Godman).

F. DILATATA, Nees.—Gray, 706.
Graciosa (1307). San Miguel (*Brown*, 364).

F. TAMARISCI, Nees. *Jungermannia Tamarisci*, Watson (2) 616; Drouet 217.—Gray, 706.
Corvo (1300). Flores (1301, 1302, 1303, 1304).

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* Determinations by Professor L. M. Underwood.

Fayal (*Brown*, 370, 371). San Miguel (1305, 1306). Sta. Maria (1306, *a*, 1306, *b*, 1306, *c*).

LEJEUNEA SERPYLLIFOLIA, Mitten, 323.
San Miguel (*Machado*, 10, *a*).

PORELLA PLATYPHYLLA, Lindb. *Jungermannia platyphylla*, Watson (2) 616; Drouet 216.— Gray, 708. *pl. 24.*
Flores (1309).

P. CANARIENSIS, (Web.)
Sta. Maria (1309, *a*).

RADULA COMPLANATA, Dumort. *Jungermannia complanata*, Watson (2) 616; Drouet 216.— Gray, 708.
Flores (1310).

R. PHYSOLOBA, Mont. Mitten 322.
San Miguel (Godman).

R. PALLENS, Lindenb., var. MINOR, Sw. Drouet 216; Seubert 13.
San Miguel.

SCAPANIA NEMOROSA, Nees.
Flores (1308).

HERBERTA JUNIPERINA, Spruce. *Jungermannia juniperina*, Watson (2) 616; Drouet 216.
? Flores (Watson). San Miguel (1328).

BAZZANIA TRILOBATA, S. F. Gray.— Gray, 710. *pl. 24.*
San Miguel (1311).

KANTIA TRICHOMANIS, S. F. Gray. *Calypogeia trichomanis*, Mitten 321.— Gray, 713. *pl. 24.*
"Azores" (Godman).

CEPHALOZIA BICUSPIDATA, Dumort. *Trigonanthus bicuspidatus*, Mitten 318.— Gray, 712.
San Miguel.

SACCOGYNA VITICULOSA, Dumort. Mitten 320.
"Azores" (Godman).

CHILOSCYPHUS POLYANTHOS, Corda.— Gray, 716.
San Miguel (1326).

C. PUNCTATA, Tayl. *Jungermannia punctata*, Watson (2) 616; Drouet 216.
? Flores.

PLAGIOCHILA SPINULOSA, Dumort. Mitten 317.—Gray, 717.
Fayal.

JUNGERMANNIA INFLATA, Huds. Mitten 319.— Gray, 721. *pl. 25.*
"Azores" (Godman).

NARDIA CRENULATA, Lindb. *Solenostoma crenulata*, Mitten 317.— Gray, 722. *pl. 25.*
Fayal (*Brown*, 374,— doubtfully of this species). San Miguel.

N. HYALINA, Carring. *Solenostoma hyalina*, Mitten 319.— Gray, 722.
San Miguel (Godman).

METZGERIACEAE.

FOSSOMBRONIA ANGULOSA, Raddi. Mitten 324. *?Gymnomitrium erythrorhizum*, Bisch. in Seubert 12; Drouet 217; Mitten 317.— Gray, 723.
"Azores." — Sterile specimens probably of this or the next were collected by me on San Miguel (1327).

F. PUSILLA, Dumort. *Jungermannia pusilla*, Watson (2) 616; Drouet 217.— Gray, 723. *pl. 23.*
Flores (Watson).

PELLIA EPIPHYLLA, Corda. Mitten 324.—Gray, 724. *pl. 23.*
Flores (Godman).

RICCARDIA MULTIFIDA, S. F. Gray. *Aneura multifida*, Mitten 324.— Gray, 725.
Flores (Godman).

MARCHANTIACEAE.

MARCHANTIA POLYMORPHA, L. Mitten 327; Drouet 216.— Gray, 729. *pl. 22.*
San Miguel (1330).

M. PALEACEA, Bertol.
Flores (1316). Fayal (*Brown*, 369). Pico (*Brown*, 368). Terceira (1317, 1318). San Miguel (1319,

1320, 1321, 1322; *Brown*, 365, 366, 367). Sta. Maria (1322, *a*).

LUNULARIA CRUCIATA, Dumort. *L. vulgaris*, Mitten 325; Watson (2) 616; Drouet 216.— Gray, 730. *pl. 25.*

? Flores (Watson).

CONOCEPHALUM CONICUM, Wiggers. *Fegatella conica*, Mitten 327; Watson (2) 616; Drouet 216.— Gray, 729. *pl. 22.*

? Flores (Watson).

ASTERELLA AFRICANA, Underwood, nov. nom. *Rhacotheca Azorica*, Bisch. in Seubert 12. *pl. 14;* Mitten 328; Drouet 216.

Flores (1323). San Miguel (1324, 1325).

REBOULIA HEMISPHAERICA, Raddi. *Fegatella hemisphaerica*, Watson (2) 616; Drouet 216.

? Flores (Watson). Sta. Maria (1325, *a*).

Algae.*

CHARACEAE.

NITELLA HYALINA, A. Br.?

San Miguel (1397).

The absence of mature spores renders it impossible to determine it with certainty. It seems to differ from the ordinary forms of *hyalina*.— A.

CHARA FRAGILIS, Desv.

San Miguel (1398).

A very unusual form, slender-leaved and not incrusted.— A.

These plants occur in considerable abundance at Sete Cidades in the Lagoa Grande. The *Chara*, which occurs in the bay between the peninsula and the Lagoa Verde, does not extend to a depth of more than 10.5 meters. The smaller and more sparing *Nitella* lies, in the bay, only along the outer limit of growth of the other species, at a depth of about 10 meters, and extends along the

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*** Determinations and notes on my own collections, by Professor W. G. Farlow, except for Characeae, which are by Dr. T. F. Allen, and Diatomaceae, which are by Professor H. L. Smith. There is no doubt some confusion in names of species not seen by these gentlemen.**

margin of the Lagoa to the mouth of the Grotto do Inferno, where it is found in water only 3 meters deep, associated with *Potamogeton* and *Myriophyllum*. It is interesting to observe that although the Lagoa Verde (or Pequena) is connected with the Lagoa Grande by an open channel from the bay where these Characeae occur, neither species has yet been observed in the former lake, by Captain Chaves, to whom this information is due, though the *Myriophyllum* is there abundant. On the general characters and the fauna of these lakes, see Barrois, Recherches sur la faune des eaux douces des Açores. Lille. 1896.

Florideae.

Corallina officinalis, L. Seubert 11; Drouet 222.

Jania rubens, Lamx.

Corvo (1400, *a*, on *Padina*). Graciosa (1400, on *Zonaria*).

J. corniculata, Lamx. Seubert 11; Drouet 222.

Melobesia pustulata, Lamx.

Terceira (1402).

Peyssonnelia squamaria, Decn.

Terceira (1403).

Schizymenia obovata, J. Ag.

Corvo (1408).

S. undulata, J. Ag.

Terceira (1419).

Several specimens with cystocarps. They agree well with the descriptions in microscopic structure, and the more perfect specimens have the habit shown in pl. iii. of Agardh's Oefver de Capska arterna of slaegtet Iridaea. The occurrence of this species from the Cape of Good Hope in this region is interesting.

Halymenia reniformis, Ag. Seubert 10; Drouet 221.

Ceramium, sp.

Terceira (1404, on *Codium tomentosum*.)

This small species lining the fronds of *Codium tomentosum* has much external resemblance to *C. codicola*, J. Ag., growing on the same species on the coast of California. The specimens from Terceira had neither tetraspores nor cystocarps. The nodes were completely corticated throughout and the structure of the sterile plant resembles more that of *C. rubrum* than that of *C. codicola*. It may perhaps be the alga described by Grunow under the name of *C. rubrum* var. *Liebetruthii*, Grun. in Piccone Crociera del Corsaro, p. 55.

C. RUBRUM, Ag. Seubert 9; Drouet 223.
Pico.

C. DIAPHANUM, Ag. Seubert 9; Drouet 223.

C. SCOPARIUM, DC. Drouet 223.
Sta. Maria.

C. CILIATUM, Ag. Seubert 9; Drouet 223.

CALLITHAMNION TETRAGONUM, Ag. Seubert 9; Drouet 223.

SPERMOTHAMNION TURNERI, Aresch. *Callithamnion Turneri*, Seubert 9; Drouet 223.

CENTROCERAS CLAVULATUM, C. Ag.
Terceira (1417).

POLYSIPHONIA FRUTICULOSA, Spreng. Seubert 9; Drouet 222.
Corvo (1405).

CHONDRIA TENUISSIMA, Ag. Seubert 10; Drouet 221.

LAURENCIA OBTUSA, Lamx., var. PYRAMIDATA, J. Ag.
Corvo (1406, 1407).

L. PINNATIFIDA, Lamx. *Chondria pinnatifida*, Seubert 10; Drouet 221.

NITOPHYLLUM LACERATUM, Grev. *Delesseria lacerata*, Seubert 11; Drouet 222. *? Fucus laceratus*, Drouet 220.

PLOCAMIUM COCCINEUM, Lyngb. *Delesseria Plocamium*, Seubert 11; Drouet 222.
Terceria (1409).

CHRYSYMENIA UVARIA, J. Ag. *Chondria uvaria*, Seubert 10; Drouet 221.

RHODYMENIA PALMETTA, Grev. *Sphaerococcus Palmetta*, Seubert 10; Drouet 221.

SPHAEROCOCCUS CORONOPIFOLIUS, Ag. *Fucus coronopifolius*, Drouet 220.

GIGARTINA ACICULARIS, Lamx. *Sphaerococcus acicularis*, Seubert 10; Drouet 221.

G. TEEDII, Lamx. *Sphaerococcus Teedii*, Seubert 10; Drouet 221.

PTEROCLADIA CAPILLACEA, Bornet & Thur?

Flores (1411). Terceira (1412). Sta. Maria (1412, *a*).

A considerable number of specimens was collected. No cystocarps, however, were present and the determination of sterile plants must be necessarily somewhat uncertain in this case.

GELIDIUM FILICINUM, Bory?

Terceira (1413).

A small sterile specimen of what may be this species was collected. I am indebted to Dr. Ed. Bornet for an authentic specimen of *G. filicinum* with which the present plant agrees in general habit, but, in the absence of fruit, the determination must remain uncertain.

G. SPINULOSUM, J. Ag. Bornet, Mém. Soc. Cherbourg. **28**: 272. *Sphaerococcus corneus*, var. *spinulosus*, Seubert 10; Drouet 222.

Corvo (1414).

G. SPINULOSUM, var. OXYACANTHUM, J. Ag.

San Miguel (1415).

G. CARTILAGINEUM, L. *Fucus cartilagineus*, Drouet 220.

Fayal.

G. CORNEUM, Ag. *Sphaerococcus corneus*, Drouet 221.

G. CORNEUM, var. PINNATUM. *Sphaerococcus*, Seubert 10; Drouet 221.

G. CORNEUM, var. PULCHELLUM. *Sphaerococcus*, Seubert 10; Drouet 222.

CAULACANTHUS USTULATUS, Kütz.

Terceira (1416).

NEMALION LUBRICUM, Duby.

Terceira (1418).

FUCOIDEAE.

SARGASSUM FISSIFOLIUM, Mont. ? *S. vulgare*, Seubert 11. ? *S. vulgare*, var. *tenuifolium*, Seubert 11; Drouet 221. ? *S. stenophyllum*, Seubert 11; Drouet 221.

Corvo (1423). Terceira (*Sampaio*). San Miguel (1424). ? Sta. Maria (Drouet, under *S. vulgare*).

Several specimens of *Sargassum* collected are probably the same as the *S. fissifolium* (Mert.) Mont. as understood by Piccone in

Crociera del Corsaro, and some others, which is, however, not the *S. fissifolium* of J. Agardh. The Azorean specimens all belong, with one possible exception, to a single species and resemble forms of *S. cymosum* in many respects, but the leaves all have well-marked glands. There are but very few bladders and the lower leaves are frequently forked and in a few cases pinnately divided. Both antheridia and oogonia are borne in the same receptacles, which are generally closely cymose but in a few places become more loosely branched but not racemose. The main axes are usually somewhat compressed and smooth, but in older specimens they become more cylindrical with a few ill-developed spines. The probability is that the specimens might be considered as forms of *S. cymosum* or *S. linifolium*, but they do not exactly agree with the types of either species and the name given above may be used temporarily to designate them.

S. BACCIFERUM, Ag. Seubert 11; Drouet 221. *Fucus natans*, Drouet 220.

CYSTOSEIRA ABROTANIFOLIA, L. Seubert 11; Drouet 221. San Miguel (1422).

C. ABIES-MARINA, Ag. Seubert 11; Drouet 221. Terceira (*Sampaio*).

FUCUS VESICULOSUS, L. *? F. vesiculosus*, var. *spiralis*, Seubert 11; Drouet 220. Terceira (1421). *Sta. Maria.*

Small specimens, the largest hardly 5 cm. high and without bladders. They may be considered to be the same as the Adriatic form referred to *F. Sherardi* by authors, considered by some as identical with *F. virsoides*, J. Ag. and by others as a depauperate form of *F. vesiculosus*. The specimens collected were attached and can therefore be regarded as belonging to the marine flora of the Azores. *F. vesiculosus*, var. *limitaneus*, Mont., of the Canaries, is a still more reduced form of this species.

F. CERANOIDES, DC. Drouet 220.

ASCOPHYLLUM NODOSUM, Le Jol. *Fucus nodosus*, Seubert 11; Drouet 220; Fayal (*Brown*). Pico. Terceira (1420). San Miguel. *Sta. Maria.*

The specimens collected were not found attached but washed ashore, and came in all probability from a more northern coast.

Phaeosporeae.

Colpomenia sinuosa, Dèrb. & Sol.
Corvo (1428, with *Cladophora*, etc.).
Cladostephus spongiosus, Ag. Seubert 9; Drouet 222.
Sphacelaria tribuloides, Menegh.
San Miguel (1426, on *Sargassum*).
S. scoparia, var. pennata, Ag. Seubert 9.
Halopteris filicina, Kütz. *Sphacellaria filicina*, Seubert 9; Drouet 222.
Stypocaulon scoparium, Kütz. *Sphacelaria scoparia*, Seubert 9; Drouet 222.
Corvo (1427, with *Laurencia*, etc.). Fayal (*Brown*).
Leathesia difformis, Aresch.
Sta. Maria (1431, *a*).
Mesogloia Leveillei, Menegh.
Corvo (1429, with *Colpomenia*, etc., 1430, 1431).

Dictyotaceae.

Zonaria flava, C. Ag. Seubert 11; Drouet 220.
Graciosa (1432).
Padina Pavonia, Lamx. *Zonaria Pavonia*, Seubert 11; Drouet 220.
(Corvo (1433). Terceira (*Sampaio*). *Sta Maria*.
Dictyota dichotoma, Lamx. *Zonaria dichotoma*, Seubert 11. *? Z. dichotoma*, var. *intricata*, Seubert 11; Drouet 220.

Diatomaceae.

Lysigonium varians, De Toni.
Terceira (*Trelease*)*. — The frustules rather larger than common.

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* These Terceira specimens, except the first, are from the overflow of the street fountains in Angra.

CYMATOPLEURA TURGIDA, Kütz.
Terceira (*Trelease*).
AMPHORA OVALIS, Kütz.
Terceira (*Trelease*).
ODONTIDIUM MUTABILE, W. Sm.
Terceira (*Trelease*).
NAVICULA HEMIPTERA, Kütz.
Terceira (*Trelease*).
N. TABELLARIA, Kütz.
Terceira (*Trelease*).
N. VIRIDIS, Kütz.
Terceira (*Trelease*).

Professor Smith reports, with these, several other small specimens, perhaps *N. acuta*, *N. leptocephala*, etc. Moseley, *l. c.* 323, mentions one *Navicula* from San Miguel, and diatoms from the same island are further vaguely mentioned by O'Meara in Dyer, 326, and Archer, *l. c.* 328.

SYNEDRA ULNA, Ehr.?
Terceira (*Trelease*).
S. RADIANS, Kütz.?
Terceira (*Trelease*).
GOMPHONEMA OLIVACEUM, Kütz.
Terceira (*Trelease*).
G. TENELLUM, Kütz.
Terceira (*Trelease*).
TABELLARIA FENESTRATA, Kütz.
Terceira (*Trelease*).

ZYGNEMACEAE.

SPIROGYRA, sp. Archer 332.
San Miguel.
S. LONGATA, Kütz.? Archer 332.
San Miguel.
S. PRINCEPS, Cl.? Archer 332.
San Miguel.

Desmidiaceae.

Staurastrum, sp. Archer 329.
San Miguel.
S. striolatum, Arch. Archer 330.
San Miguel.
S. tetracerum, Ralfs. Archer 330.
San Miguel.
Euastrum ansatum, Ralfs. Archer 330.
San Miguel.
Arthrodesmus bifidus, Breb. Archer 329.
San Miguel.
Rhaphidium polymorphum, Fresen. *Ankistrodesmus falcatus*, Archer 329.
San Miguel.
Cosmarium bioculatum, Breb. Archer 330.
San Miguel.
C. Meneghinii, Breb. *C. crenulatum*, Archer 330.
San Miguel.
C. tinctum, Ralfs. Archer 330.
San Miguel.
C. venustum, Breb. Archer 330.
San Miguel.
Disphinctium Thwaitesii, De Ton. *Cosmarium Thwaitesii*, Archer 330.
San Miguel.

Chlorophyceae.

Penium digitus, Breb. Archer 330.
San Miguel.
Botryococcus Braunii, Kütz. Moseley 322; Archer 328.
?Chroococcus, Moseley 322, 323.

San Miguel (1459, Lagoa das Furnas; 1460, 1461, Sete Cidades).— An abundant water bloom.

This species was reported by Archer, *l. c.*, as the most common chlorophyllaceous alga collected by Moseley at the hot springs of Furnas. The general appearance of the colonies and their larger

size differ somewhat from the common form of *B. Braunii* which occurs in the United States. The size of the individual cells, 11–13 $\mu \times$ 7–9 μ, however, indicates that the alga should be regarded rather as a coarse form of *B. Braunii* than a form of *B. gigantea*, Reinsch, of South Africa, in which the dimensions of the cells are given as considerably larger.

UROCOCCUS HOOKERIANUS, Kütz.

Flores (1458).

The specimens here referred to this species form small gelatinous masses which in their microscopic structure bear a considerable resemblance to *Hormotila mucigena*, Borzi. The average diameter of the cells, not including the gelatinous walls, is 8 μ. The absence of any unstriated mucilaginous stalks, however, points rather to the genus *Urococcus*, and the present plant agrees so well with an authentic specimen of *U. Hookerianus*, for which I am indebted to Dr. Ed. Bornet, that, in spite of the color of the cell contents which are deep grass-green rather than red, it can be referred to that species without much doubt. A point of more importance is that the alga of the Azores was collected in salt or, at least, brackish water, while the original specimens of *U. Hookerianus* grew in fresh water. The species has also been reported by Borzi, in Malpighia. **1**: 137, as occurring in Sicily, but it is not stated whether in fresh water or marine. *U. Foslieanus*, Hansg., Tromsoe Museums Aarsheft. **13**: 156, agrees with the Azores alga in being marine and having green rather than red cell contents, but differs in having cells which are from 15–25 μ in diameter.

DICTYOSPHAERIUM EHRENBERGIANUM, Näg. Archer 329.

San Miguel.

TETRASPORA, sp.

Terceira (1434).— Fragmentary.

TETRAEDRON TETRAGONUM, Hansg. *Polyedrium tetragonum*, Archer 329.

San Miguel.

SCENEDESMUS OBLIQUUS, Kütz. *S. acutus*, Archer 329.

San Miguel.

S. BIJUGATUS, Kütz. *S. obtusus*, Archer 329.

San Miguel.

S. QUADRICAUDA, Breb. Archer 329.

San Miguel.

PEDIASTRUM BORYANUM, Menegh., var. GRANULATUM, Br. *P. granulatum*, Archer, 329.

San Miguel.

P. TETRAS, Ralfs. Archer 329. *P. heptactis*, Archer, 329.
San Miguel.

CODIUM ADHAERENS, C. Ag.
Sta. Maria (1435, *a*).

C. TOMENTOSUM, Stack. Seubert 10; Drouet 222.
Terceira (1435, some of it overgrown by *Ceramium*).

Bryopsis penicillata, Suhr, in Seubert 9, *pl. 1*; Drouet 222; De Toni, Sylloge Algarum. **2**: 437.

TRENTEPOHLIA AUREA, Mart. Drouet 223.
San Miguel (1436, very abundant on the old aqueduct at Pico do Carvâo; *Machado*, 24).

T. ABIETINA, Hansg.
Sta. Maria (1436, *a*),— Determined by De Wildemann.

CLADOPHORA PROLIFERA, Kütz. *Conferva prolifera*, Seubert 9; Drouet 223.
Corvo (1437, associated with *Polysiphonia*, etc.; 1438, associated with *Colpomenia*, etc.). Fayal (*Brown*).

C. sp. *?Conferva catenata*, Seubert 9; Drouet 223.
Flores (1439, 1464, in fresh water).

CHAETOMORPHA, sp. *? Conferva Linum*, Seubert 9; Drouet 223.
Corvo (1441, with *Polysiphonia*, etc.).

CONFERVA BOMBYCINA, C. Ag.
San Miguel (1440).

ULOTHRIX, sp.
Terceira (1442, in fresh water).

STIGEOCLONIUM, sp.
Sta. Maria (1440, *a*, 1440, *b*).

ENTEROMORPHA COMPRESSA, Grev. *Ulva compressa*, Seubert 10.

E. COMPRESSA, f. PROLIFERA, Kjellm. *Ulva compressa*, var. *prolifera*, Seubert 10; Drouet 222.

E. INTESTINALIS, Lk. *Ulva intestinalis*, Seubert 10.
Sta. Maria (1442, *a*, in brackish water).

E. INTESTINALIS, var. SUHRII. *Ulva intestinalis*, var. *Suhrii*, Seubert 10.

E. RAMULOSA, Hook. *Ulva ramulosa*, Seubert 10; Drouet 222.

Corvo (1443, with *Polysiphonia*, etc., 1444).

ULVA LACTUCA, L. Seubert 10; Drouet 222

Pico.

U. LINZA, L. Seubert 10; Drouet 222.

U. RIGIDA, C. Ag. Seubert 10; Drouet 222.

Flores (1445, *a*). Fayal (*Brown*).

BULBOCHAETE, 2 sp. Archer 332.

San Miguel.

OEDOGONIUM CAPILLIFORME, Kütz., var. AUSTRALE, Wittr.

Terceira (1463).

Two sterile and undeterminable species of the genus from Corvo (1446), Flores (1447), Terceira (1448), and San Miguel (1449, 1450); and two undetermined species also reported from the last-named island by Archer, p. 332.

COLEOCHAETE, sp. Archer 330.

San Miguel.

MYXOPHYCEAE.

DICHOTHRIX BAUERIANUS, Flah.

San Miguel (1452).

RIVULARIA NITIDA, C. Ag.

Flores (1462, at Coste).

R. BULLATA, Berk.

San Miguel (1451).

TOLYPOTHRIX, sp. Archer 332.

San Miguel.

NOSTOC ELLIPSOSPORUM, Rabenh.?

Corvo (1453).

The specimens were without spores and the species cannot be considered certain.

N. VERRUCOSUM, Vaucher.

Terceira (1453 *a*, on rocks in running and falling water, in a ribeira, at 1,000 ft. elevation).

ANABAENA TORULOSA, Lagerh.

Corvo (1455,—mixed with the next).

NODULARIA HARVEYANA, Thuret.
Corvo (1454).
CYLINDROSPERMUM LICHENIFORME, Kütz.
San Miguel (1456).
C. MAJUS, Kütz.
San Miguel (1457).
PHORMIDIUM LAMINOSUM, Gomont.
San Miguel (1457, *a*, in hot springs).
OSCILLATORIA FORMOSA, Bory.
Sta. Maria (1454, *a*).
O. ANIMALIS, Ag.? *Phormidium smaragdinum*, Archer 337.
San Miguel.
CHROOCOCCUS MINOR. Archer 335.
San Miguel.
MERISMOPAEDIA, sp. Archer 334.
San Miguel.

Lichenes.*

LICHINEACEAE.

LICHINA PYGMAEA, Ag.—Leighton, 11.
San Miguel (1466). —Now sometimes known as *Pygmaea pumila*, OK.

COLLEMACEAE.

LEPTOGIUM BURGESSII, Mont.?—Leighton, 33.
Sta. Maria (1475, *a*).
L. CHLOROMELUM, Nyl.?—Leighton, 32.
San Miguel (*Machado*, 49). Sta. Maria (1475, *b*, 1486, *b*).
L. PHYLLOCARPUM, (Nyl.), var. DAEDALEUM, Nyl.
San Miguel (*Machado*, 36).
L. SIMULATUM, Schaer.
San Miguel (*Machado*, 47.)
Two other, immature, representatives of this genus were collected at Sta. Maria (1475, *c*, 1509, *c*).

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* Determinations by Professor T. A. Williams.

COLLEMA, sp. Drouet 217.
Terceira (1475, — abundant on branches of *Eriobotrya*). San Miguel.

STEREOCAULACEAE.

STEREOCAULON PASCHALE, Fr. Seubert 12; Drouet 218; Watson (2) 617.— Leighton, 70.
Flores? San Miguel.
S. SPHAEROPHOROIDES, Tuckerm. Drouet 218.
Corvo (1478, *a*). Flores (1477, 1478).
SIPHULA CERATITES, Fr. Drouet 219.
San Miguel.

CLADONIACEAE.

CLADONIA ALPESTRIS, L. *C. rangiferina*, var. *alpestris*, Seubert 12; Drouet 217.— Leighton, 66 (under *C. sylvatica*).
San Miguel (1476).
C. COCCIFERA, Hoffm. *C. cornucopioides*, Drouet 217. *Scyphophorus coccineus*, Drouet 218.— Leighton, 62.
San Miguel.
C. DEGENERANS, Fckl. Seubert 11; Drouet 217.— Leighton, 59.
C. FOLIACEA, Wain., var. CONVOLUTA, Wain. *Scyphophorus convolutus*, Drouet 217.
San Miguel.
C. GRACILIS, Hoffm. *? C. rangiferina*, var. *gracilis*, Drouet 217. *Cenomyce gracilis*, Watson (2) 617; Drouet 217.— Leighton, 58.
Flores? San Miguel.
C. LEPORINA, Fr. Drouet 217.
Pico.
C. PYXIDATA, Fr. Drouet 217.
San Miguel.
C. PYXIDATA, var. CHLOROPHAEA, Fckl.— Leighton, 57.
San Miguel (*Brown*).

C. RANGIFERINA, Hoffm. *Cenomyce rangiferina*, Watson (2) 617.— Leighton, 67.
Flores?

C. RANGIFORMIS, Hoffm. var. PUNGENS, Wain. *C. furcata*, var. *pungens*, Seubert 11; Drouet 217.— Leighton, 53 (as *C. pungens*).
Sta. Maria (1476, *a*).

C. SQUARROSA, Hoffm.? Stirton 373. *?Scyphophorus caespitosus*, Drouet 217.— Leighton, 61.
San Miguel.

ROCCELLACEAE.

ROCCELLA PHYCOPSIS, Ach. Drouet 218; Stirton 373.— Leighton, 74..
San Miguel.

R. TINCTORIA, Ach. Watson (2) 617; Seubert 13; Drouet 218.— Leighton, 73.
Corvo (1479, 1480). Flores (1481). San Miguel.

R. FUCIFORMIS, Ach. *Physcia fuciformis*, Drouet 219.— Leighton, 74.
San Miguel.—Perhaps referring to one of the preceding?

RAMALINACEAE.

EVERNIA DIVARICATA, Ach. Seubert 13; Drouet 218.

E. VULPINA, Ach. *Chlorea vulpina*, Drouet 219.
San Miguel.

RAMALINA CALICARIS, Fr. Drouet 218.— Leighton, 83.
San Miguel.

R. CUSPIDATA, Nyl.— Leighton, 89.
Corvo (1511). Graciosa (1512).

R. FRAXINEA, Ach. Watson (2) 617; Drouet 218.
Flores?

R. POLLINARIA, Ach.— Leighton 87.
Flores (1484, 1485).

R. SCOPULORUM, Ach. Seubert 13; Drouet 218.— Leighton, 88.

San Miguel.

R. SUBGENICULATA, Nyl.

San Miguel (1486; *Brown*).

R. THRAUSTA, Nyl. Drouet 218.— Leighton, 83.

Pico. San Miguel.

R. VULCANICA, Nyl.?

Graciosa (*Brown*). Sta. Maria. (1466, *c*).

USNEACEAE.

USNEA BARBATA, Ach. Drouet 218.— Leighton, 75.

Pico. San Miguel.

U. CERATINA, Schaer., var. SCABROSA, Ach.?— Leighton, 77 (under *U. barbata*).

Corvo (1483).

U. FLORIDA, Ach. Drouet 218.— Leighton, 75 (under *U. barbata*).

Pico.

U. HIRTA, Hoffm. Drouet 218.— Leighton, 76 (under *U. barbata*).

Corvo (1482). Pico.

U. PLICATA, Ach. Watson (2) 617; Drouet 219.— Leighton, 76 (under *U. barbata*).

Flores? Pico.

PARMELIACEAE.

PARMELIA CAPERATA, Ach. Watson (2) 616; Drouet 219; Stirton 373.— Leighton, 114.

Flores (1495). San Miguel.

P. LAEVIGATA, Nyl. Watson (2) 616; Drouet 219.— Leighton, 128.

Flores?

P. OLIVACEA, Ach.

San Miguel (*Machado*, 43).

P. OLIVETORUM, Nyl.— Leighton, 121.

Sta. Maria (1495, *a*).

P. PERFORATA, Ach. Stirton 373.— Leighton, 123.
San Miguel.

P. PERFORATA, f. CILIATA, Nyl.?— Leighton, 124.
Flores (1494).

P. PERLATA, Ach. Drouet 219; Stirton 373.— Leighton, 119.
San Miguel. Sta. Maria.

P. PERLATA, var. CILIATA, Nyl.— Leighton, 120.
Flores (1503).

P. RETICULATA, Tayl. Watson (2) 616; Drouet 219.
Flores?

P. REVOLUTA, Nyl.— Leighton, 129 (under *P. laevigata*).
San Miguel (*Brown; Machado*, 40). Sta. Maria (1503, *a*).

Two undetermined specimens of this genus also respectively from Flores (1514) and San Miguel (*Machado*, 37).

THELOSCHISTES FLAVICANS, Muell.— Leighton, 130 (under *Physcia*).
Flores (1496). Sta. Maria (1496, *a*).

T. PARIETINA, Norm. *Parmelia parietina*, Seubert 12; Drouet 219.— Leighton, 131 (under *Physcia*).
Fayal (*Brown*,— passing into f. *cinerascens*). Graciosa (1497). Sta. Maria (1497, *a*).— These probably of the variety *ectanea*.

STICTACEAE.

STICTA AURATA, Ach. Drouet 219.— Leighton, 112.
Pico. San Miguel (1489; *Brown*). Sta. Maria (1489, *a*).

S. DAMAECORNIS, Ach. Watson (2) 616; Stirton 373.
San Miguel.

S. DAMAECORNIS, var. CANARIENSIS, Ach. Seubert 12; Drouet 219; Stirton 373.
Flores (1515). Terceira (1493). San Miguel (1494).

S. HERBACEA, Ach. *Parmelia herbacea*, Watson (2) 616; Drouet 219.
Flores?

S. PULMONARIA, Hoffm. *S. pulmonacea*, Watson (2) 616; Drouet 219.— Leighton, 111.
Flores (1490, 1492). San Miguel (1491). Sta. Maria (1491, *a*, 1491, *b*).

S. SCROBICULATA, Ach. Drouet 219.— Leighton, 110.
San Miguel.

PELTIGERACEAE.

NEPHROMIUM LAEVIGATUM, Ach.
San Miguel (*Machado*, 34, 48 — a dark-colored form). Sta. Maria (1486, *a*, 1509, *b*).

PELTIGERA HORIZONTALIS, Hoffm. Drouet 219; *Peltidea horizontalis*, Watson (2) 616.— Leighton, 104.
Flores (1516). San Miguel. Sta. Maria.

P. POLYDACTYLA, Hoffm.— Leighton, 103.
Flores (1487, 1488).

PHYSCIACEAE.

PHYSCIA LEUCOMELA, Ach. *Parmelia leucomela*, Seubert 12; Drouet 219. *P. leucomelas*, Watson (2) 617.— Leighton, 138.
Flores (1498, 1499). San Miguel (1500; *Machado*, 40, *a*). Sta. Maria (1500, *a*, 1500, *b*).

P. STELLARIS, Ach. Drouet 219.— Leighton, 140.
Sta. Maria.

PYXINE COCOES, Nyl. Drouet 220.
San Miguel.

P. SOREDIATA, Fr.
San Miguel (*Machado*, 35).

PLACODEACEAE.

PLACODIUM FULGENS, DC.
San Miguel (*Machado*, 41).

Pannariaceae.

Pannaria molybdaea, Tuckerm.
Corvo (1501). Flores (1502).
P. plumbea, Delis.? — Leighton, 154.
Flores (1513).— Perhaps merely a form of the last.

Lecanoraceae.

Lecanora parella, Ach.
Flores (1504). Sta. Maria (1504, *a*).
L. subfusca, var. distans, Ach.
San Miguel (*Machado*, 43, *a*).

Pertusariaceae.

Pertusaria, sp.
Flores (1505).

Lecideaceae.

Lecidea albocaerulescens, Schaer.— Leighton, 303.
San Miguel (1506, 1507).
L. cyanochroa, Stirton, Journ. Linn. Soc., Bot. **14**: 373.
San Miguel.
Buellia myriocarpa, Mudd.

Graphidaceae.

Graphis, sp.
San Miguel (*Machado*, 39).
Opegrapha saxicola, Ach., var. Persoonii, Ach.— Leighton, 403.
Flores (1508, — apparently associated with an undetermined species).

Verrucariaceae.

Normandina pulchella, Nyl. — Leighton, 440.
Flores (1509). Sta. Maria (1509, *a*).

PYRENULA MARGINATA, Trev.
San Miguel (1510; *Brown*).
ENDOCARPON, sp.
Flores (1517,— associated with 1484).

Fungi.*

AGARICACEAE.

NAUCORIA SEMIORBICULARIS, Bull.— Sacc. Syll. 5: 844.
Flores (1525).
PSATHYRELLA CRENATA, Lasch. Berkeley 352.— Sacc. Syll. 5: 1134.
San Miguel.

PHALLACEAE.

CLATHRUS CANCELLATUS, Tourn.— Sacc. Syll. 7: 19.
San Miguel (*Chaves*).

LYCOPERDACEAE.

BOVISTA PLUMBEA, P. Berkeley 353.— Sacc. Syll. 7: 96.
San Miguel.
LYCOPERDON HIEMALE, Bull.— Sacc. Syll. 7: 115, 480.
San Miguel (1527; *Brown*).
SCLERODERMA VERRUCOSUM, P. Sacc. Syll. 7: 136.
San Miguel (1528; *Brown*).

UREDINACEAE.

UROMYCES GERANII, Otth. & Wartm.— Sacc. Syll. 7: 535.
San Miguel (1549, *h*,— II. III. on *Geranium rotundifolium*).
U. LIMONII, Lév.— Sacc. Syll. 7: 532.
San Miguel (1549, *i*, — II. III. on *Statice Limonium*).

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* In the determination of these I have been assisted by Messrs. J. B. Ellis, J. B. S. Norton, C. H. Peck, and Professors P. A. Saccardo and Roland Thaxter.

U. STRIATUS, Schroet.— Sacc. Syll. 7: 542.
Corvo (1549, *g*,— II. on *Lotus hispidus*).
MELAMPSORA AECIDIOIDES, Schroet.— Sacc. Syll. 7: 590.
Terceira (1549, *d*, — II. on *Populus alba*).
M. HELIOSCOPIAE, Cast.— Sacc. Syll. 7: 586.
San Miguel (1549, *f*,— II. on *Euphorbia Peplus*).
M. HYPERICORUM, Schroet.— Sacc. Syll. 7: 591.
Corvo (1549, *e*,— II. on *Hypericum foliosum*).
PUCCINIA BUXI, DC.— Sacc. Syll. 7: 688.
San Miguel (1544,— III. on *Buxus sempervirens*).
P. HIERACII, Mart.— Sacc. Syll. 7: 633.
San Jorge (1545, *a*,— II. on *Crepis virens*). Graciosa (1546,— II. on *Taraxacum officinale*). Terceira (1545,— II. on *Leontodon hirtus;* 1545, *b*, — II. III. on *Crepis virens;* 1546, *a*, — II. on *Taraxacum officinale*). San Miguel (1546, *b*,— II. on *Taraxacum officinale*).
P. MALVACEARUM, Mont.— Sacc. Syll. 7: 686.
Fayal (*Brown, m*). Terceira (1547).— Both, III. on *Lavatera Cretica*.
P. PORRI, Wint.— Sacc. Syll. 7: 605.
Flores (1548,— III. on *Allium Porrum*).
P. RUBIGO-VERA, DC.— Sacc. Syll. 7: 624.
Flores (1549,— II. on *Holcus lanatus*, associated with immature *Phyllachora?;* 1549, *a*,— II. on *Agrostis verticillata*). Terceira (1549, *b*,— II. III. on *Agrostis verticillata*).
P. SORGHI, Schwein.— Sacc. Syll. 7: 659.
Corvo (1549, *c*,— II. III. on *Zea Mays*).
PHRAGMIDIUM VIOLACEUM, Wint.— Sacc. Syll. 7: 744.
Corvo (1537,— I.? II. III.). Flores (1538,— II.). Terceira (1539,— II.).— All on *Rubus rusticanus*.
COLEOSPORIUM SENECIONIS, Fr.— Sacc. Syll. 7: 751.
Terceira (1536,— II. on *Senecio mikanioides*).

Ustilaginaceae.

Ustilago Reiliana, Kuehn.— Sacc. Syll. 7: 471.
Flores (1540,—on *Zea Mays*).

Tilletia decipiens, Koern.— Sacc. Syll. 7: 482.
Flores (1540, *b*). San Miguel (1540, *c*; *Carreiro*).— On forms of *Agrostis Castellana*.

Entomophthoraceae.

Empusa Muscae, Cohn ?.— Sacc. Syll. 7: 281.
Flores.— On house flies.
Though numerous dead flies were observed adhering to the walls as is usual with those attacked by this fungus, my one collection (1540, *a*) does not show the latter.

Mucoraceae.

Rhizopus nigricans, Ehrenb.— Sacc. Syll. 7: 212.
Flores (1540, *c*,— on cooked corn).

Perisporiaceae.

Sphaerotheca pannosa, Lév.? — Sacc. Syll. 1: 3.
San Miguel (1543,— conidia only, on cultivated *Rosa*).

Erysiphe communis, Fr.? — Sacc. Syll. 1: 18.
Flores (1542, 1542, *a*). Sta. Maria (1542, *b*).— Conidial stage only, all on *Rumex Acetosella*.

E. lamprocarpa, Lév., f. Nicotianae ? — Sacc. Syll. 1: 16.
Corvo (1542, *c*, — conidial stage only — *Oidium Tabaci*, Thuem.,— on *Nicotiana Tabacum*).

E. necator, Schw ? — Sacc. Syll. 1: 22.
Flores (1541,— conidia only, on berries of cultivated *Vitis vulpina*).

Sphaeriaceae.

Metasphaeria nobilis, Sacc.— Sacc. Syll. 2: 169.
San Miguel (1541, *c*,— on *Viburnum Tinus*, var.

Dothidiaceae.

Phyllachora graminis, Fckl.— Sacc. Syll. **2**: 602.
Terceira (1541, *a*, — on *Agrostis verticillata*). San Miguel (1541, *b*, — on *A. Castellana*).

P. trifolii, Fckl.— Sacc. Syll. **2**: 613.
Flores (1549, *j*, — on *Trifolium glomeratum*; 1549, *k*, *l*, *m*,— on *T. Ligusticum*; 1549, *n*,— on *T. repens*). Terceira (1549, *o*, — on *T. repens*).
Frequently accompanied by the *Polythrincium* stage.

Hysteriaceae.

Lophodermium maculare, De Not.— Sacc. Syll. **2**: 791.
Terceira (1535, — on leaves of *Persea Azorica*).

Sporomega, sp. ?
San Miguel (1534, — on dead stems and legumes, apparently of cultivated *Lupinus*).

Pezizaceae.

Peziza cochleata, L. Drouet 223.— Sacc. Syll. **8**: 86.
San Miguel.

Humaria coccinea, Sacc. *Peziza coccinea*, Drouet 223.— Sacc. Syll. **8**: 119.
San Miguel.

Humaria, sp.
Sta. Maria (1533, — on the ground). — A brown species, perhaps undescribed.

Sphaerioidaceae.

Septoria piricola, Desmaz.— Sacc. Syll. **3**: 487.
San Miguel (1531, — on leaves of cultivated *Pyrus communis*).

Pestalozzia, sp.
San Miguel (1531, *a*, — on leaves of *Pyrus communis*, attacked by *Septoria piricola*).

MELANCONIACEAE.

MELANCONIUM SPHAEROSPERMUM, Lk.— Sacc. Syll. **3**: 759.
Flores (1532, — on dead stems of *Arundo Donax*).

MUCEDINACEAE.

PENICILLIUM GLAUCUM, Lk. — Sacc. Syll. **4**: 78.
Flores (1531, *b*,— on decaying fruit).

OVULARIA SPHAEROIDEA, Sacc.— Sacc. Syll. **4**: 140.
Flores (1530, *a*). Terceira (1530, *b*).— On leaves of *Lotus uliginosus*.

CERCOSPORA APII, Fres.?— Sacc. Syll. **4**: 442.
Flores (1529, 1530, — on *Apium graveolens*).

C. DUBIA, Wint.— Sacc. Syll. **4**: 456.
Terceira (1528, — on *Chenopodium ambrosioides*).

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EXPLANATION OF PLATES ILLUSTRATING AZOREAN PLANTS.

The plates were drawn by Miss Grace E. Johnson, under supervision of the author. Most of the enlarged details are after studies by Mr. J. B. S. Norton. The intention has been, where possible, to figure each species not yet figured or the illustrations of which are not readily accessible.

Plate 12. *Ranunculus megaphyllus*,— fruiting specimen, reduced one-half; part of head of fruit, × 2; achenium, × 5.

Plate 13. *Fumaria Bastardi*,— 1, plant, reduced one-half; 2, fruiting branch, natural size; 3, fruit, × 5. *F. officinalis*,— 4, fruit, × 5. *F. densiflora*,— 5, branch, natural size.

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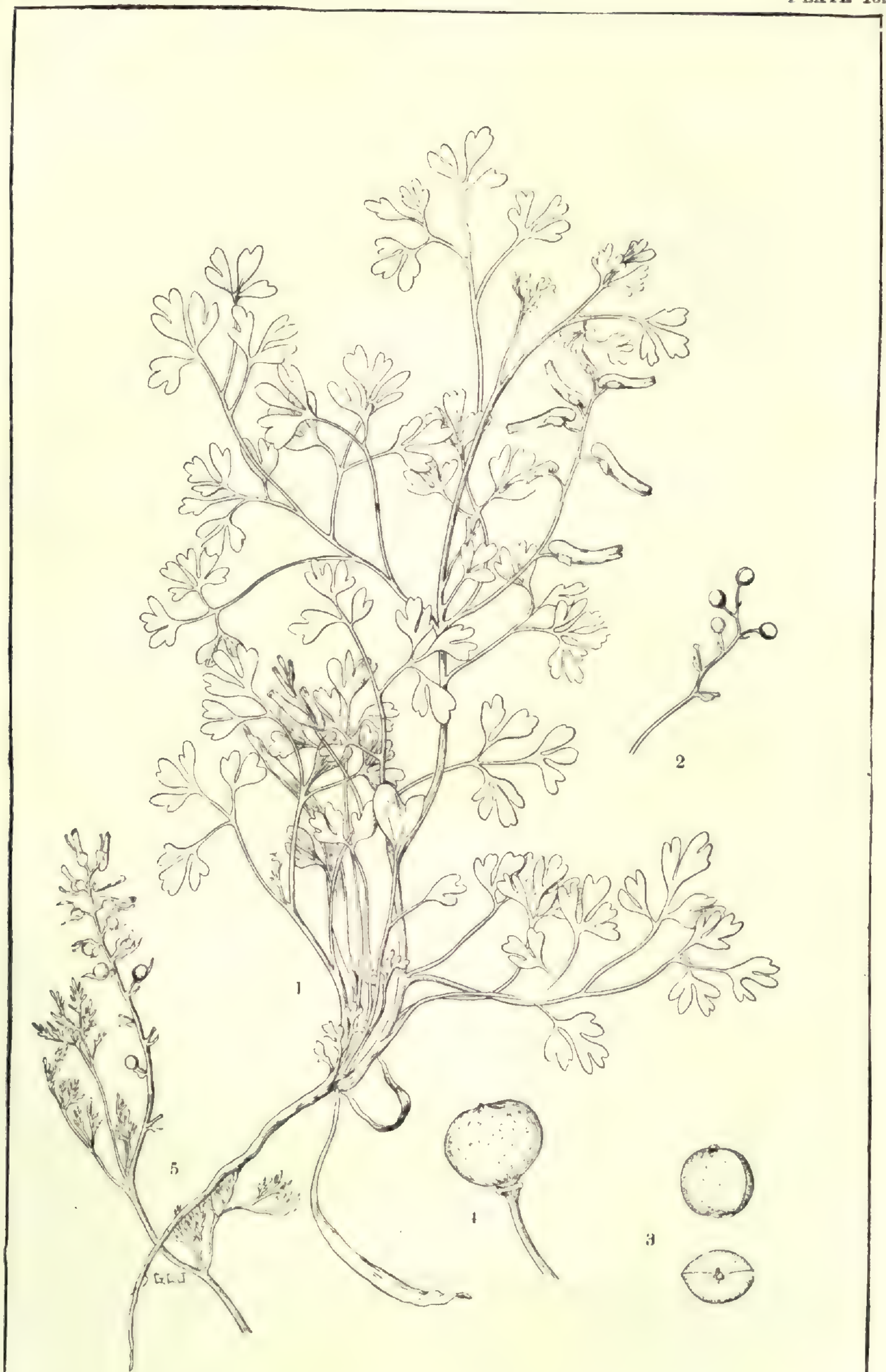

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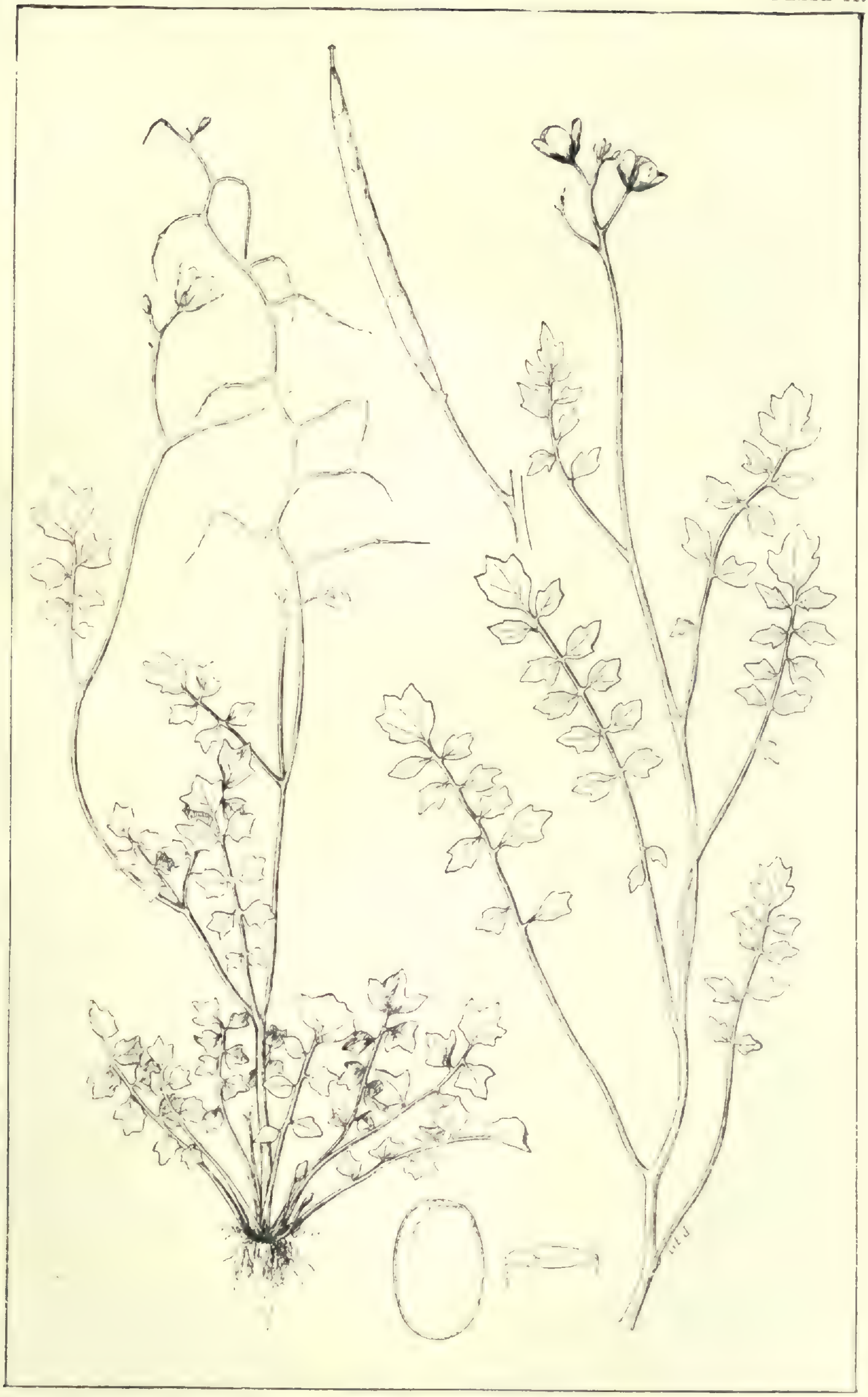

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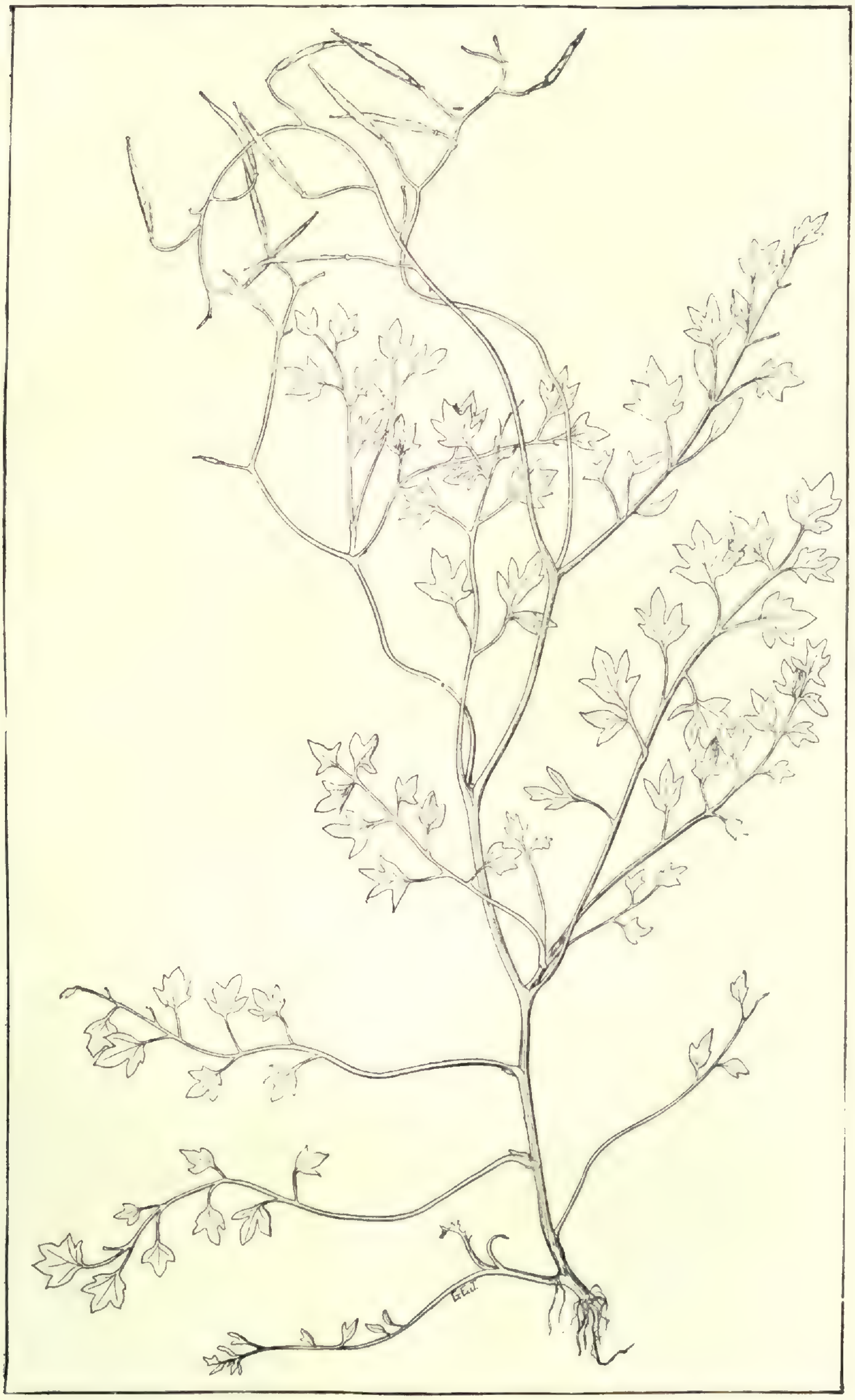
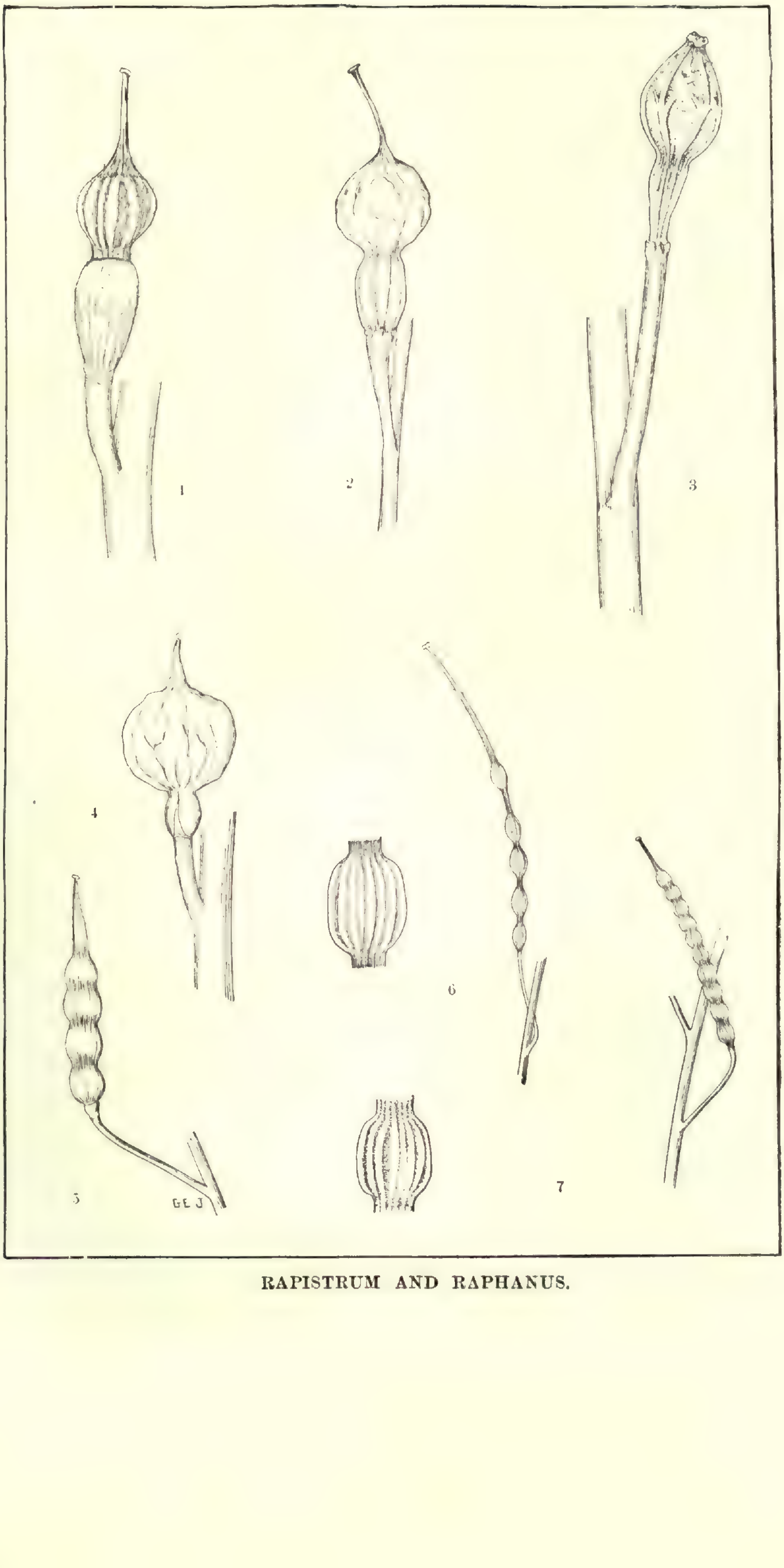


CARDAMINE CALDEIRARUM.

CARDAMINE CALDEIRARUM, VAR. AMPLIFOLIA.



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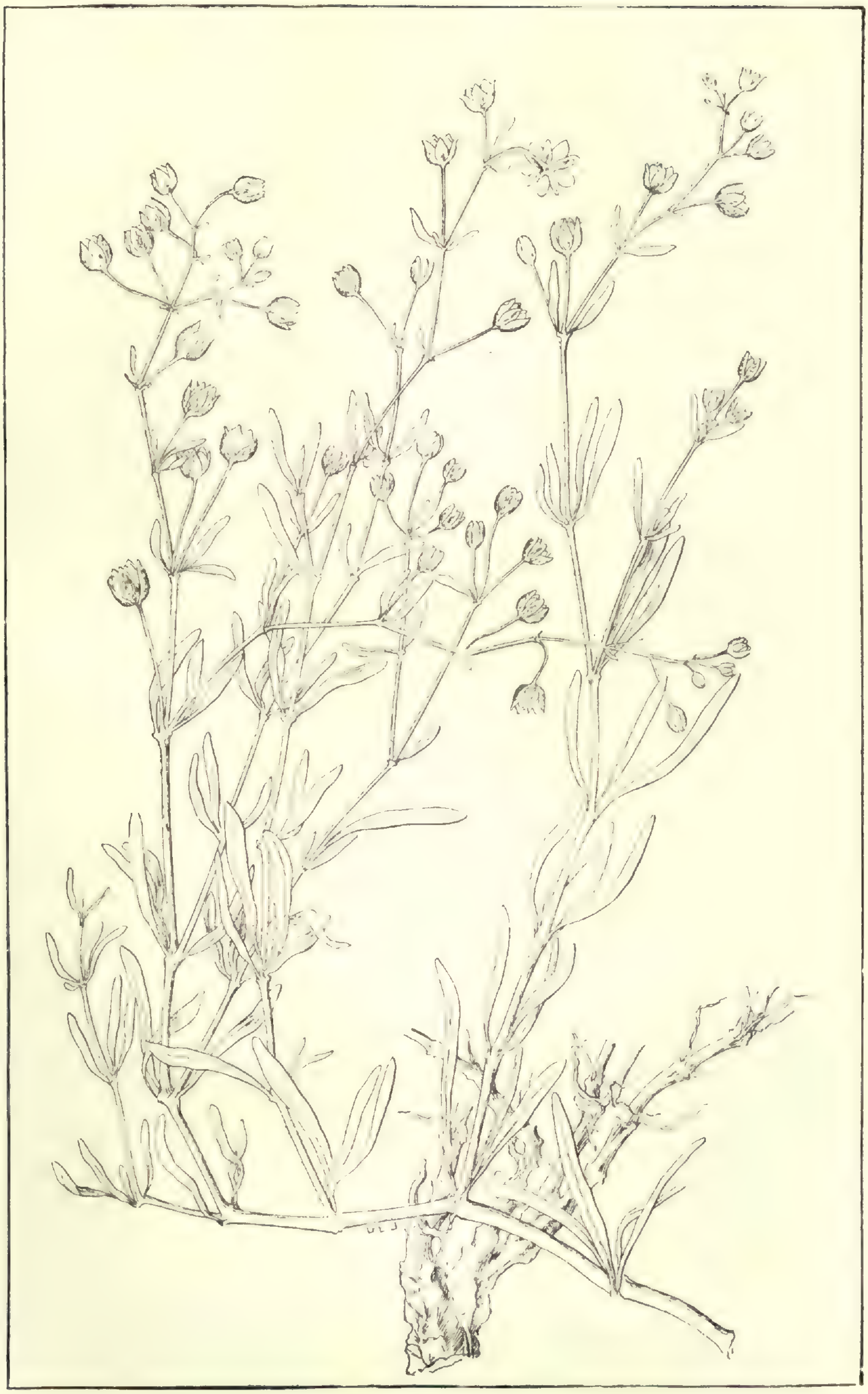


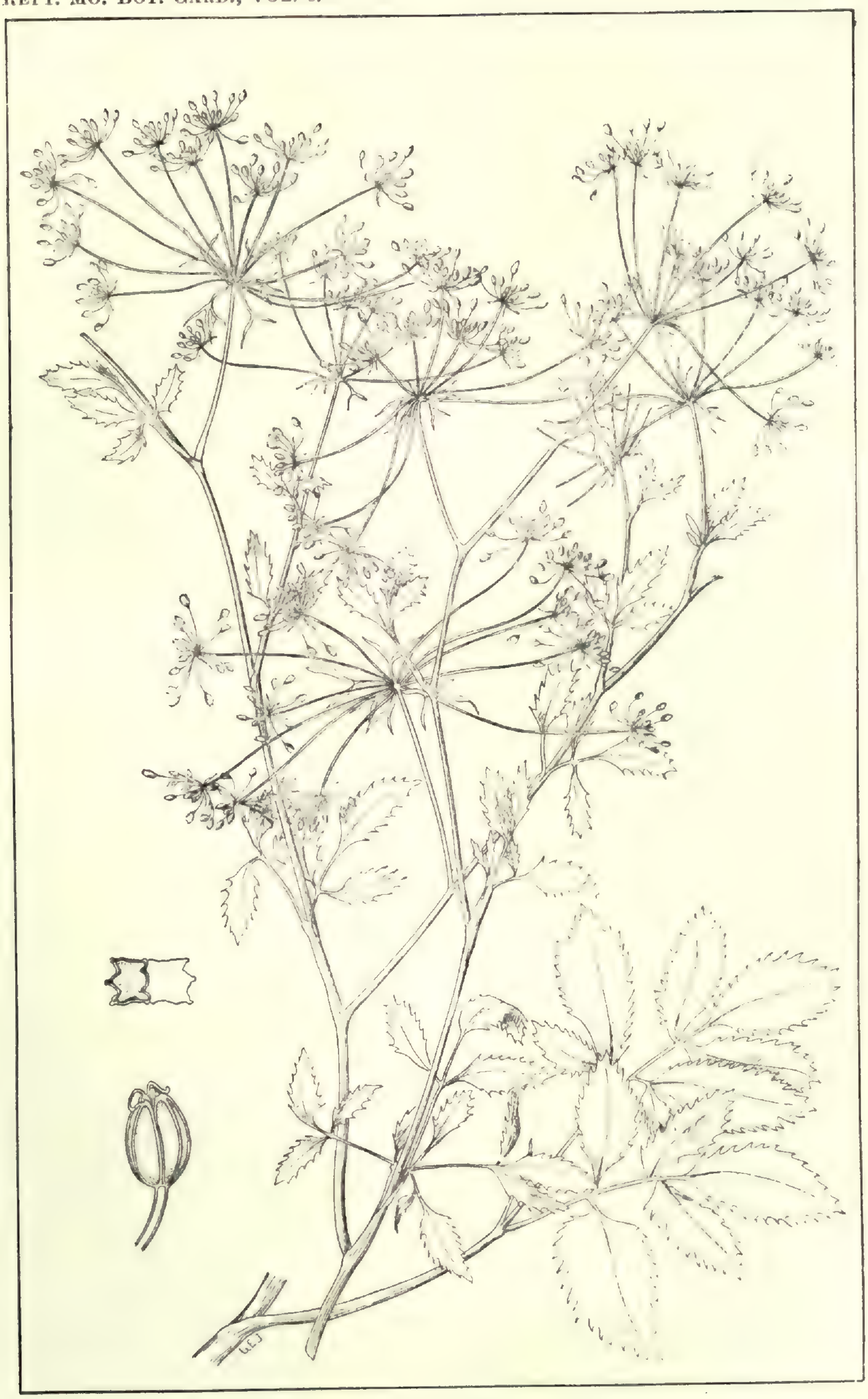
SPERGULARIA MACRORHIZA.

HYPERICUM FOLIOSUM.

HYPERICUM ELODES.

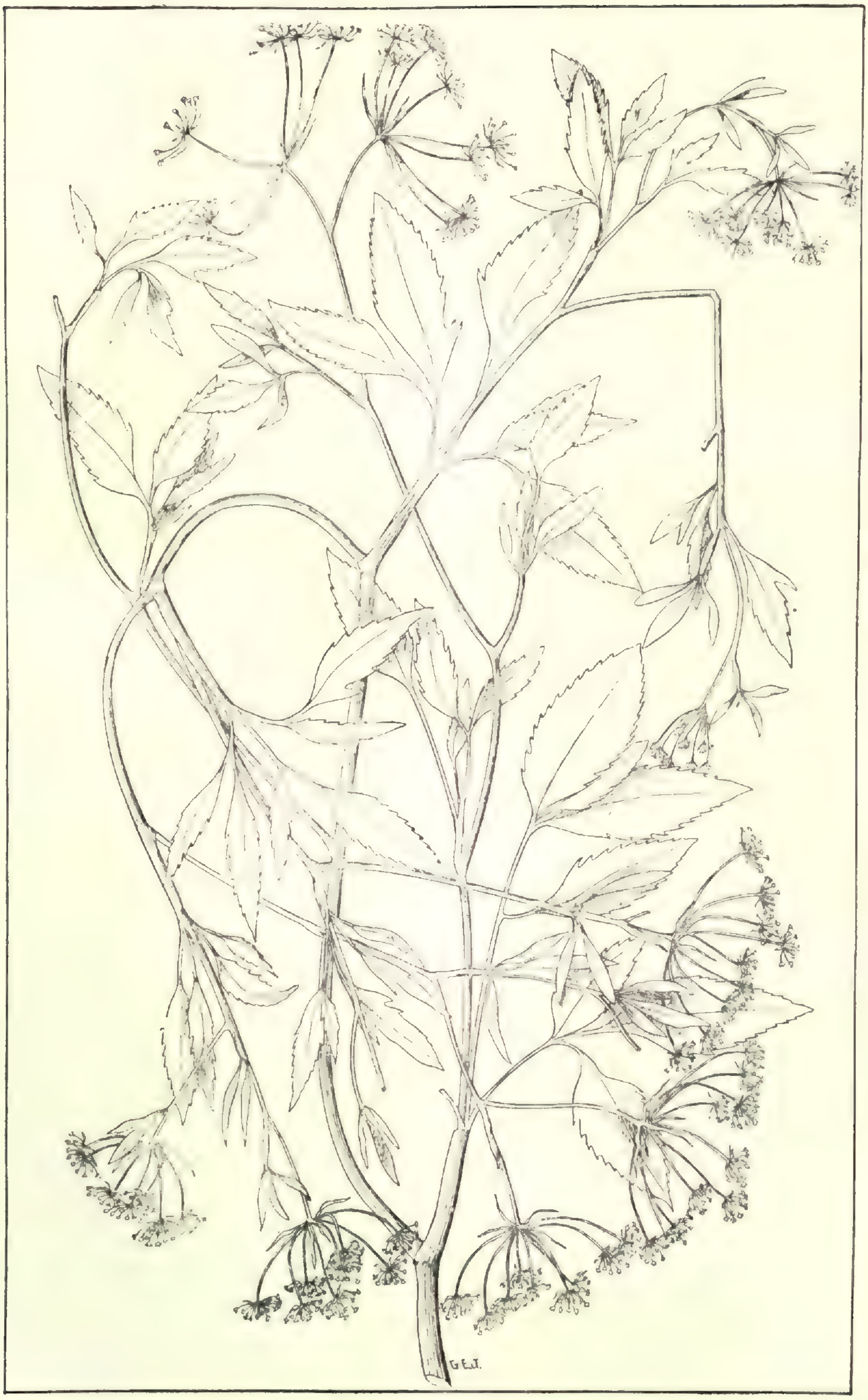
ILEX PERADO.

POTENTILLA PROCUMBENS.



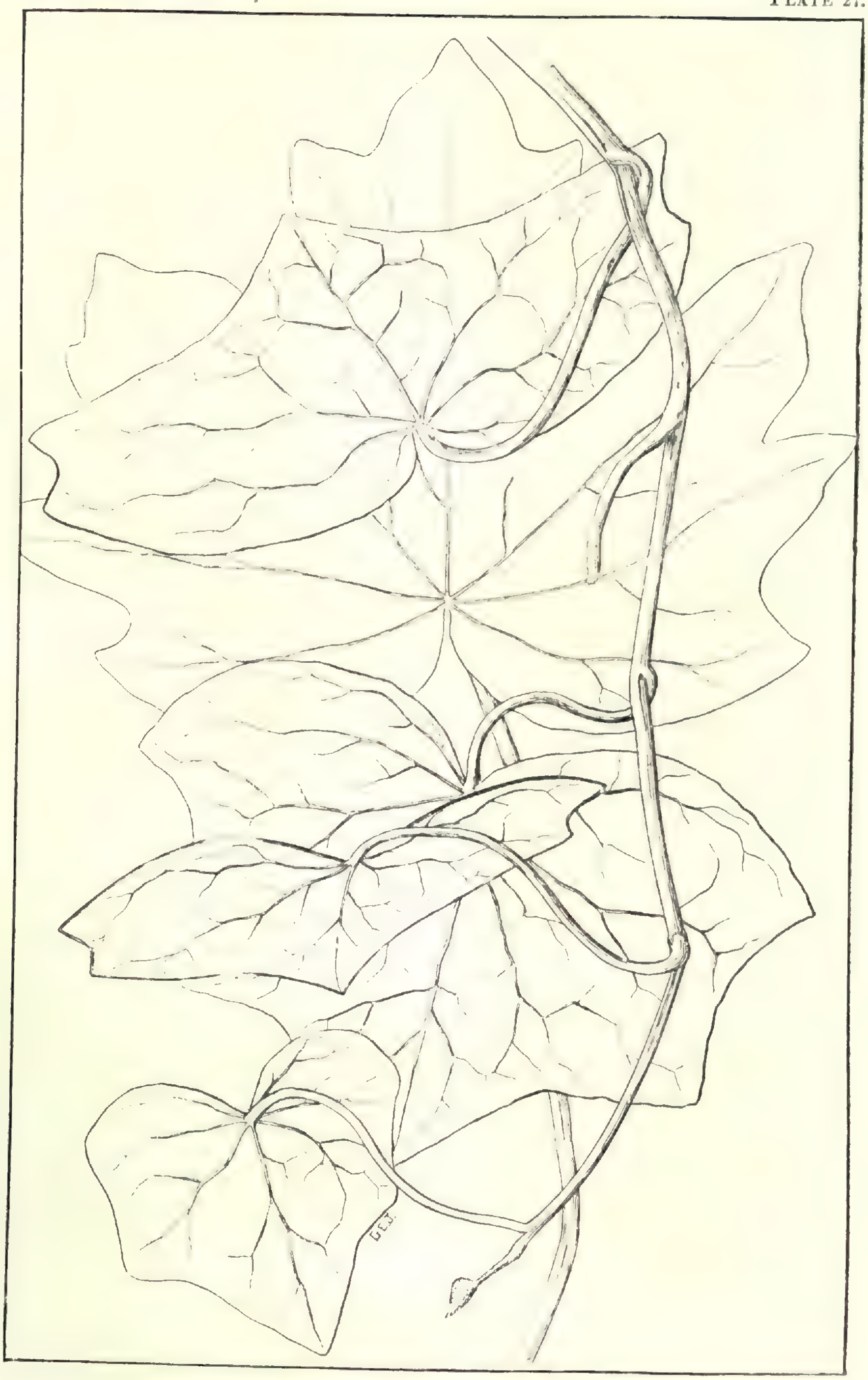
AMMI HUNTII.

AMMI SEUBERTIANUM.



AMMI TRIFOLIATUM.

CHAEROPHYLLUM AZORICUM.



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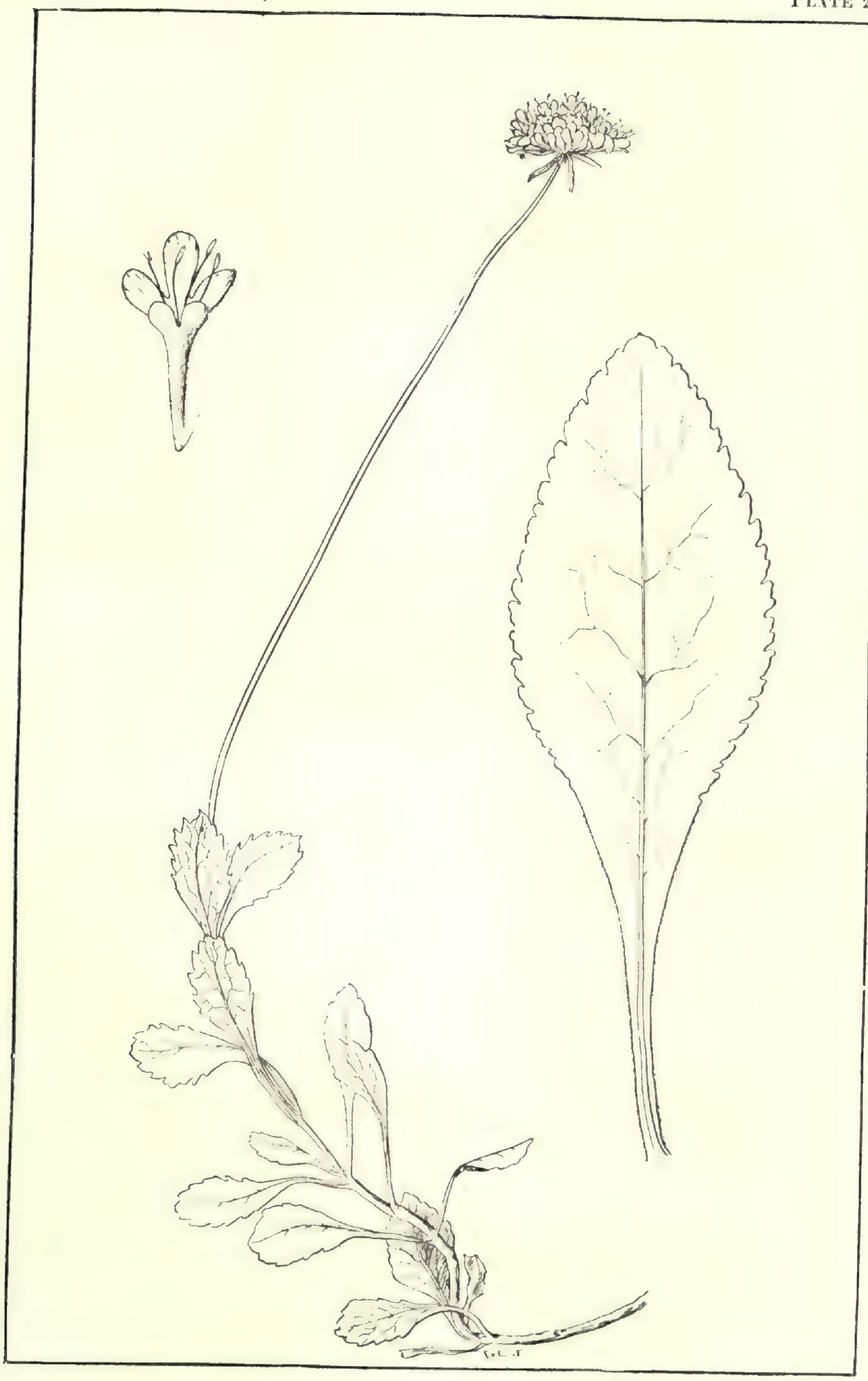

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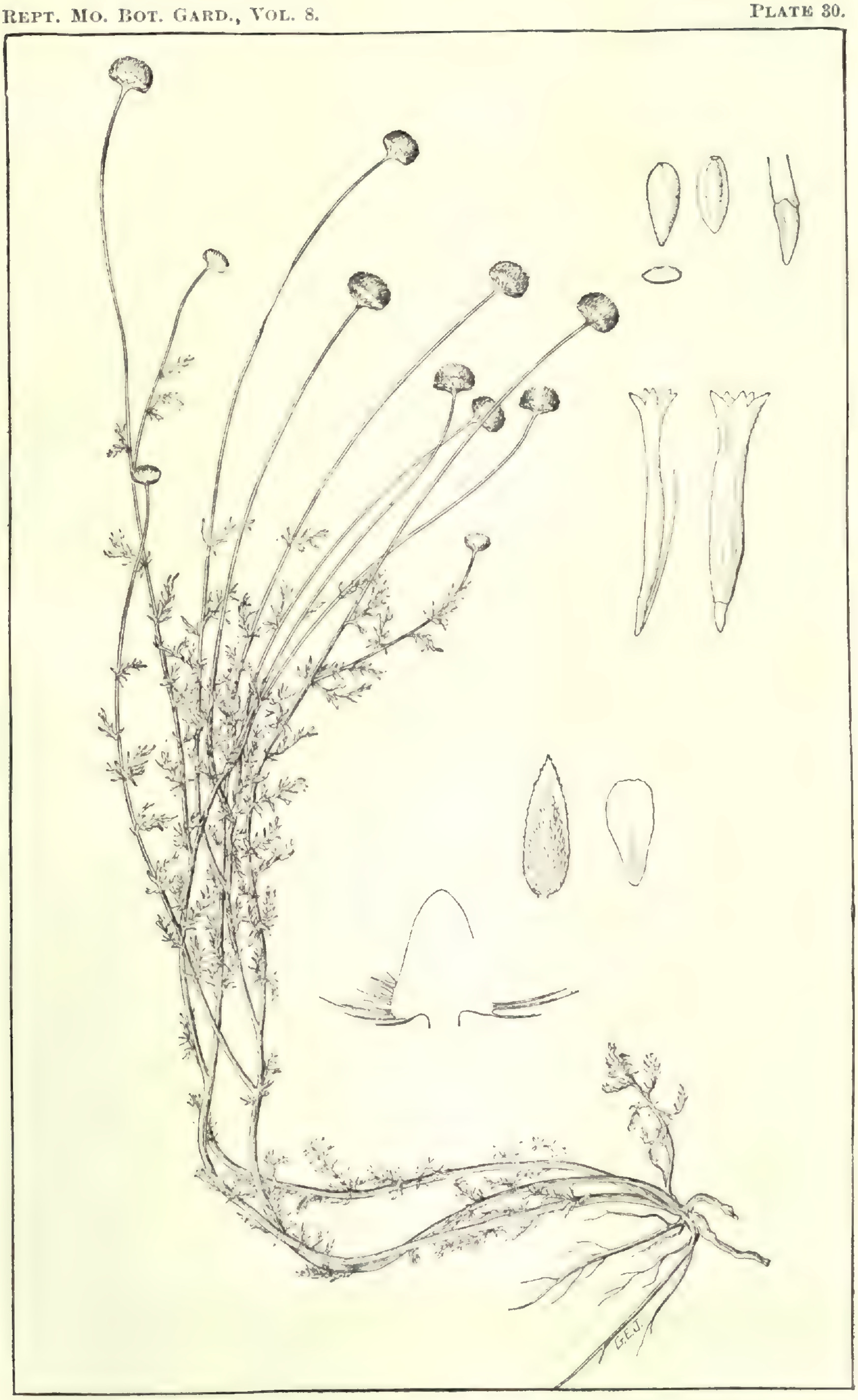

ANTHEMIS NOBILIS, VAR. AUREA.

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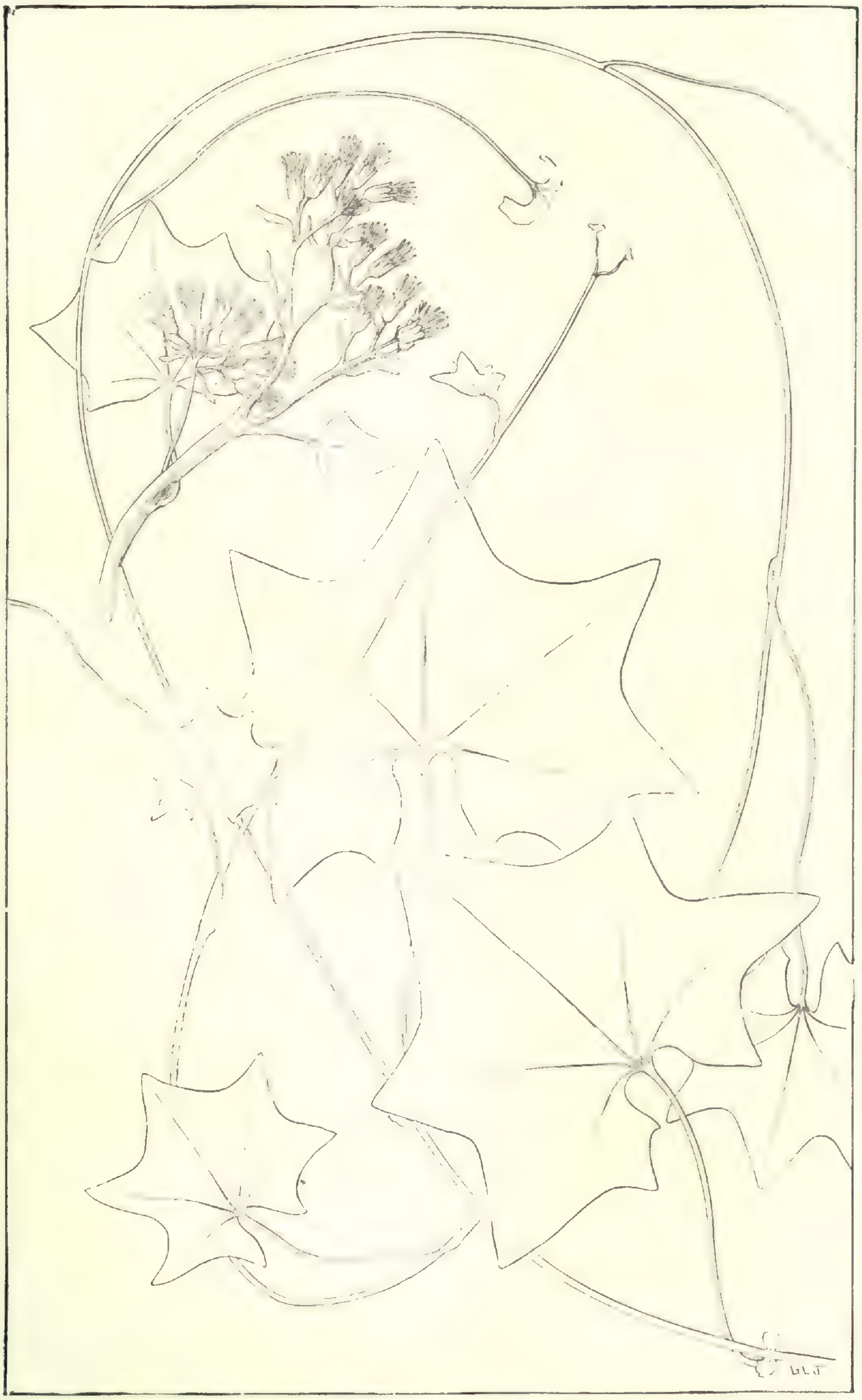
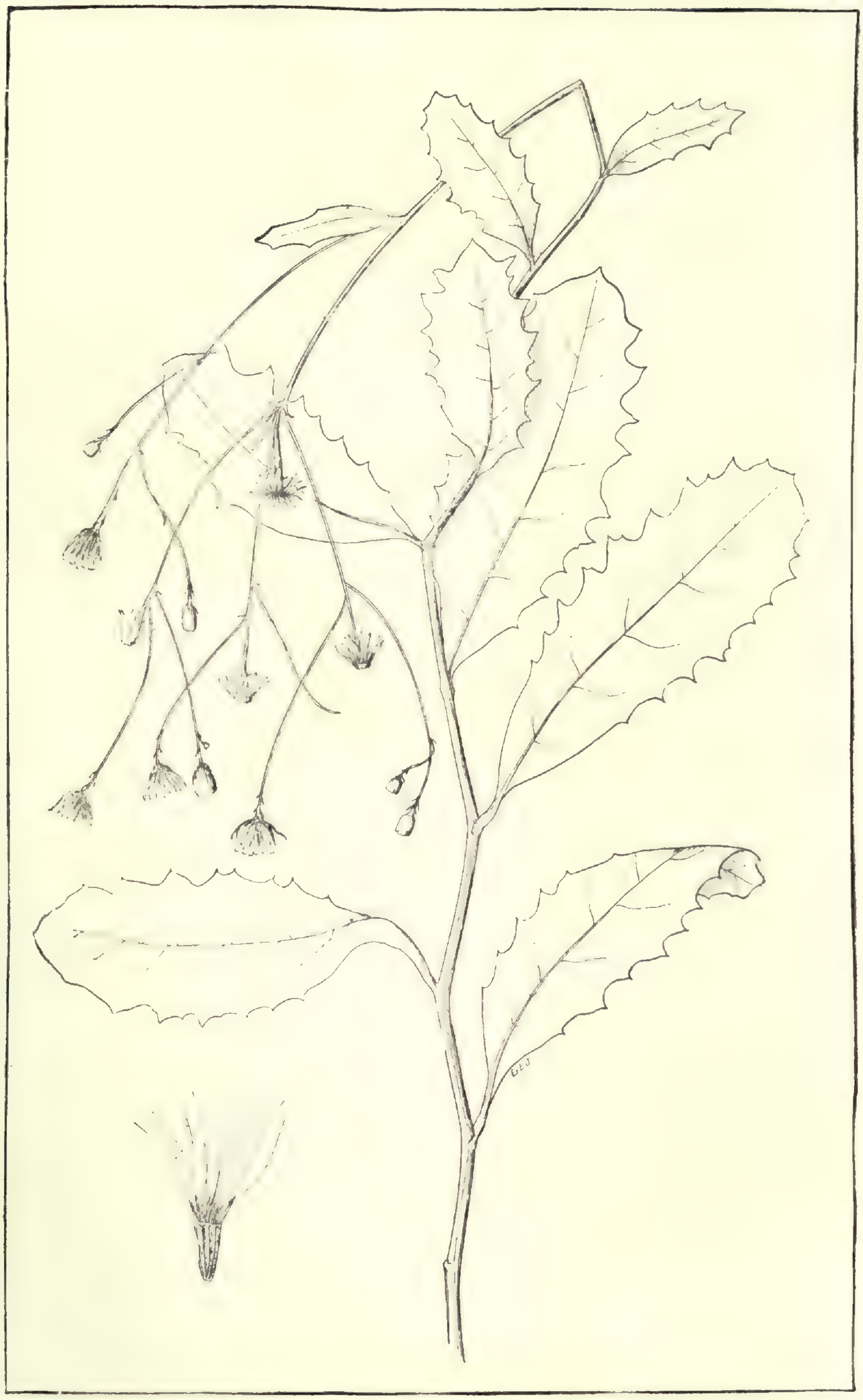
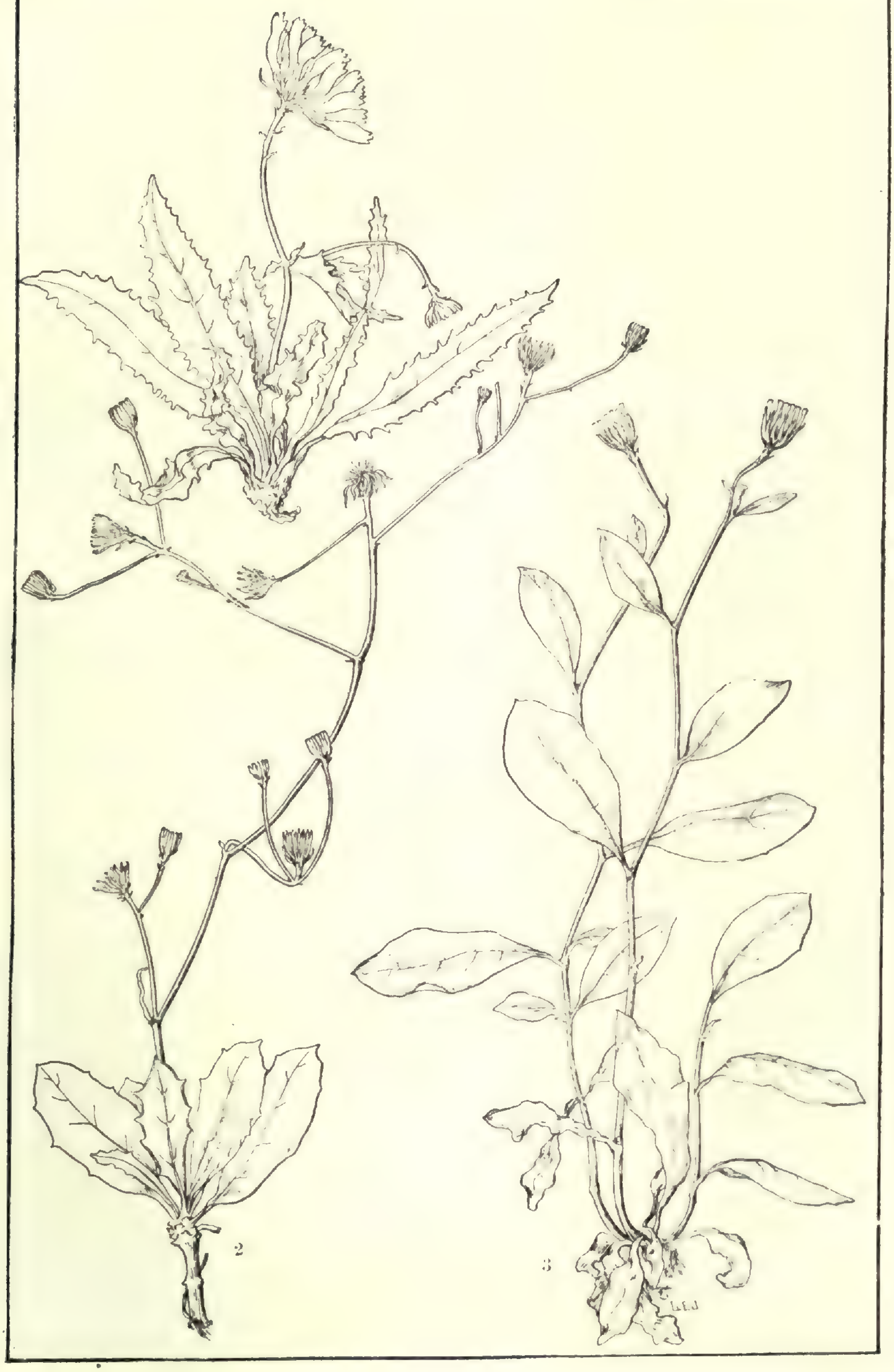


SENECIO MIKANIOIDES.



TOLPIS NOBILIS, VAR. PETIOLARIS.



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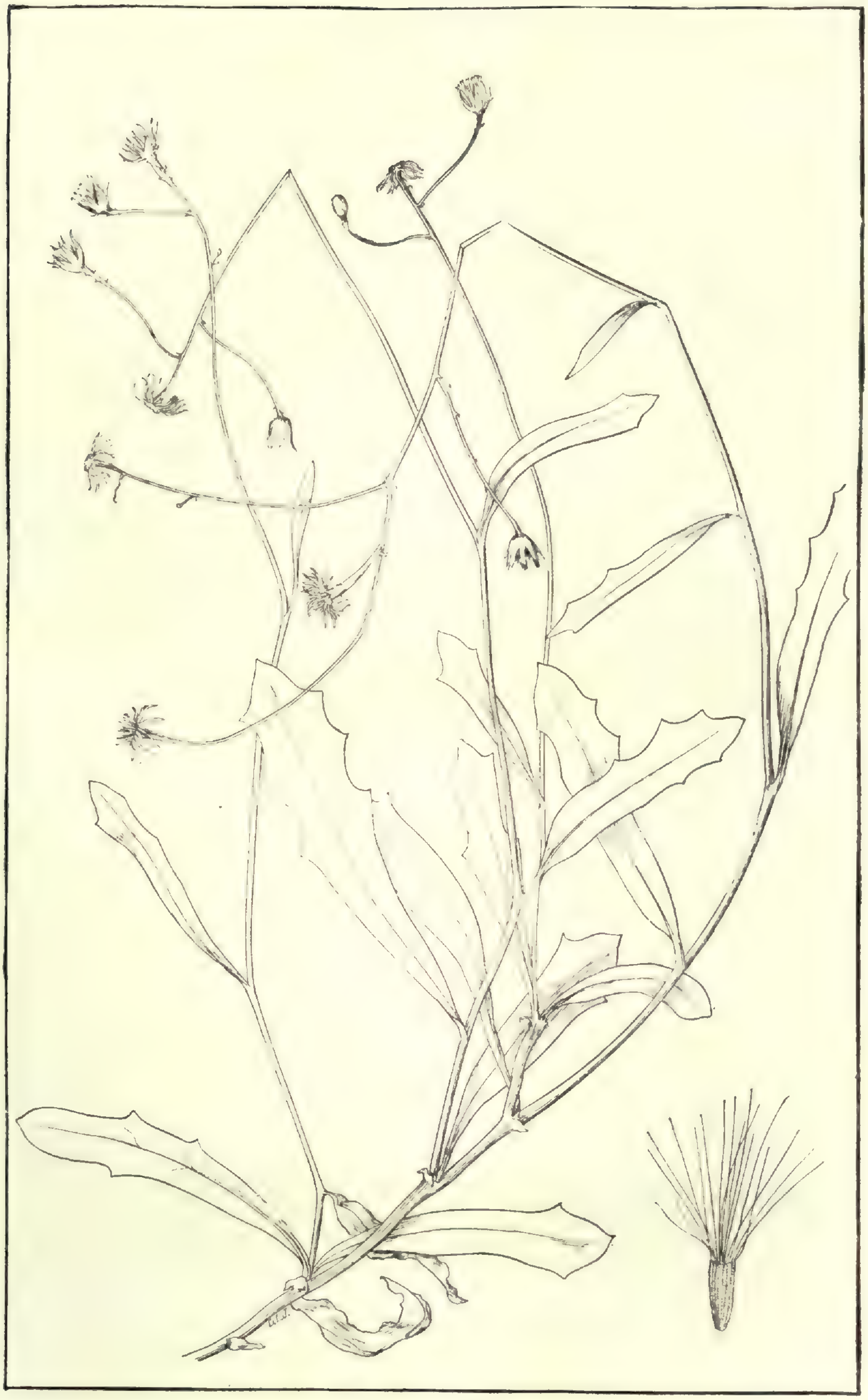

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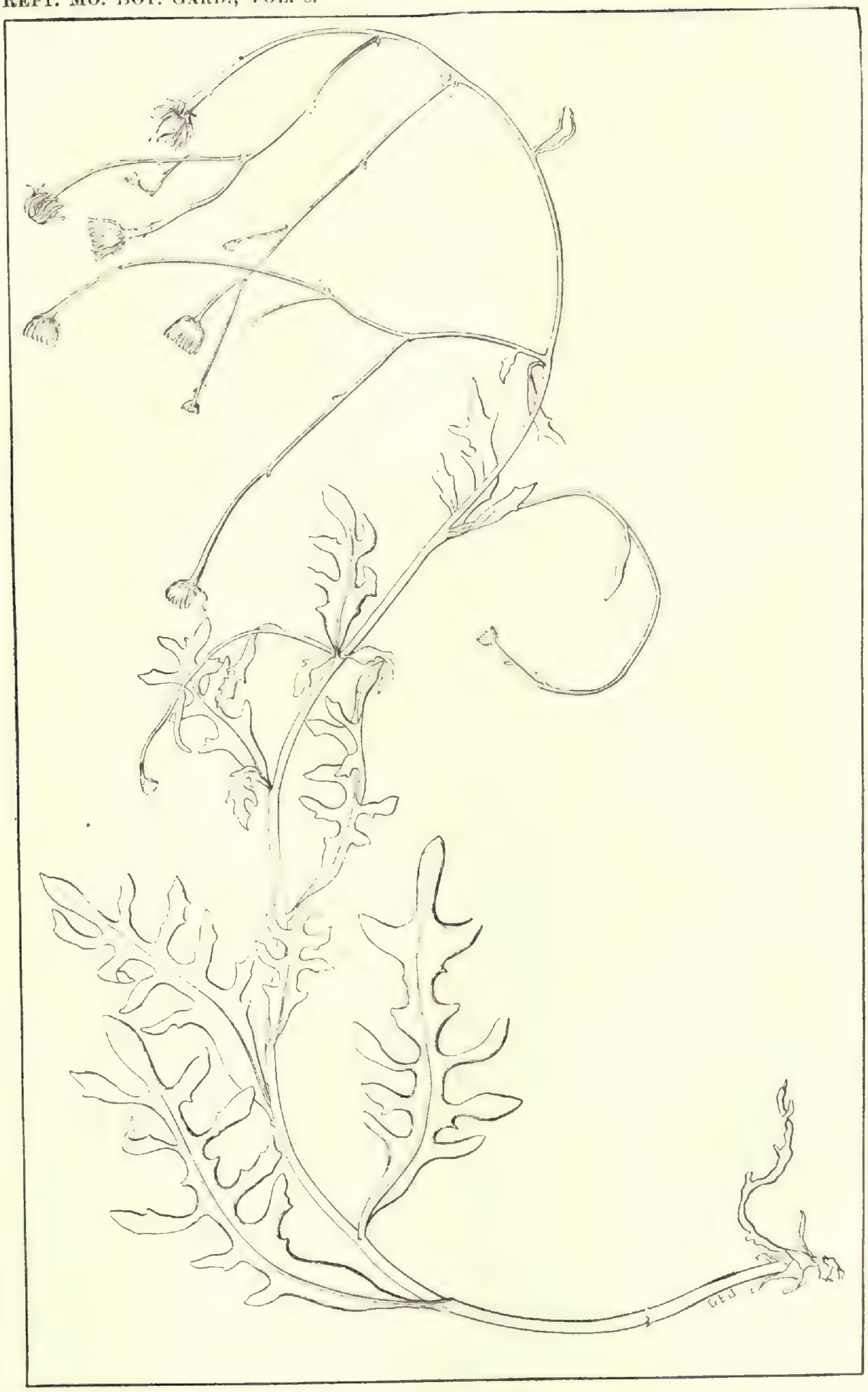
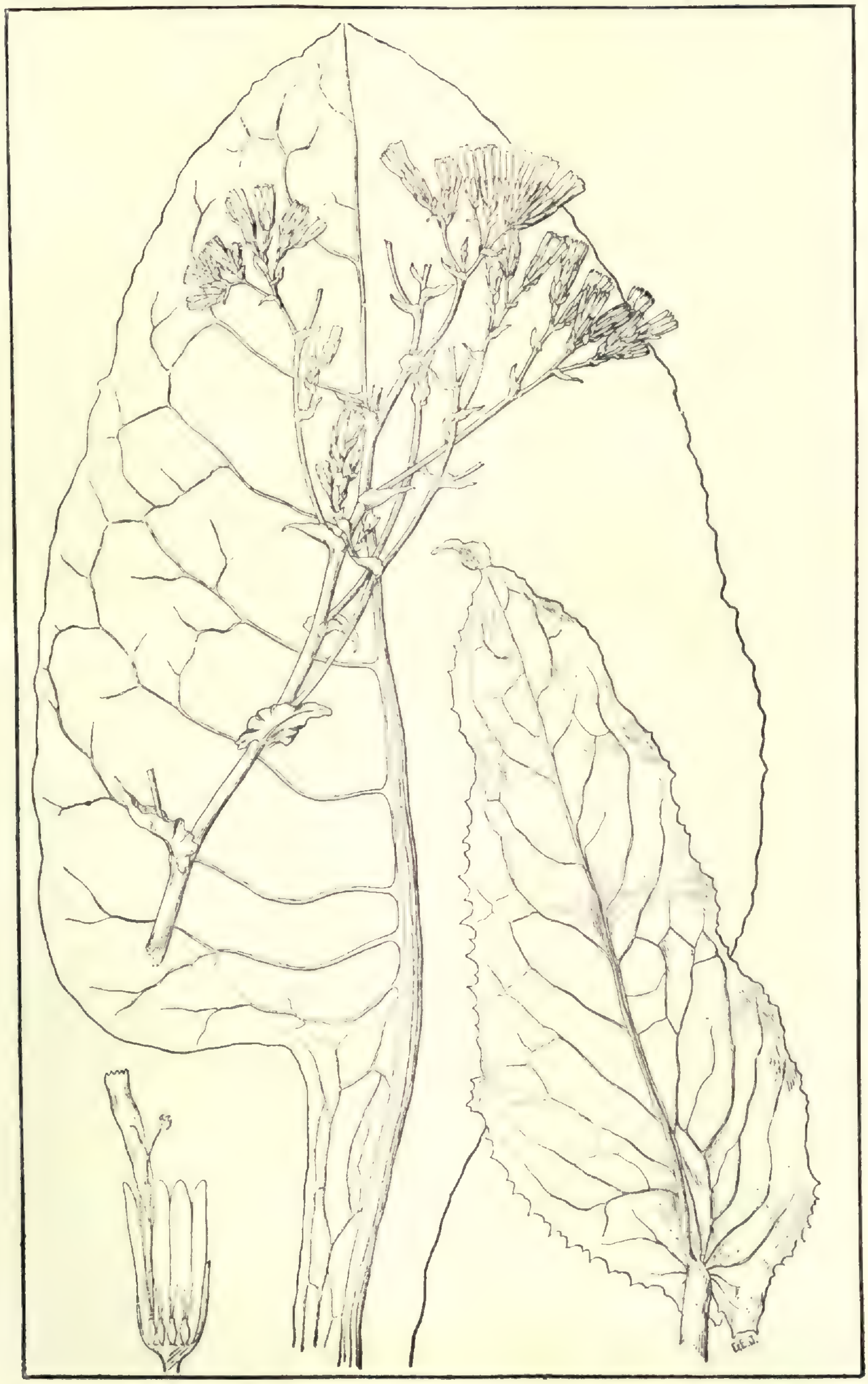


TOLPIS FRUTICOSA.

LEONTODON HIRTUS.

LEONTODON HIRTUS?



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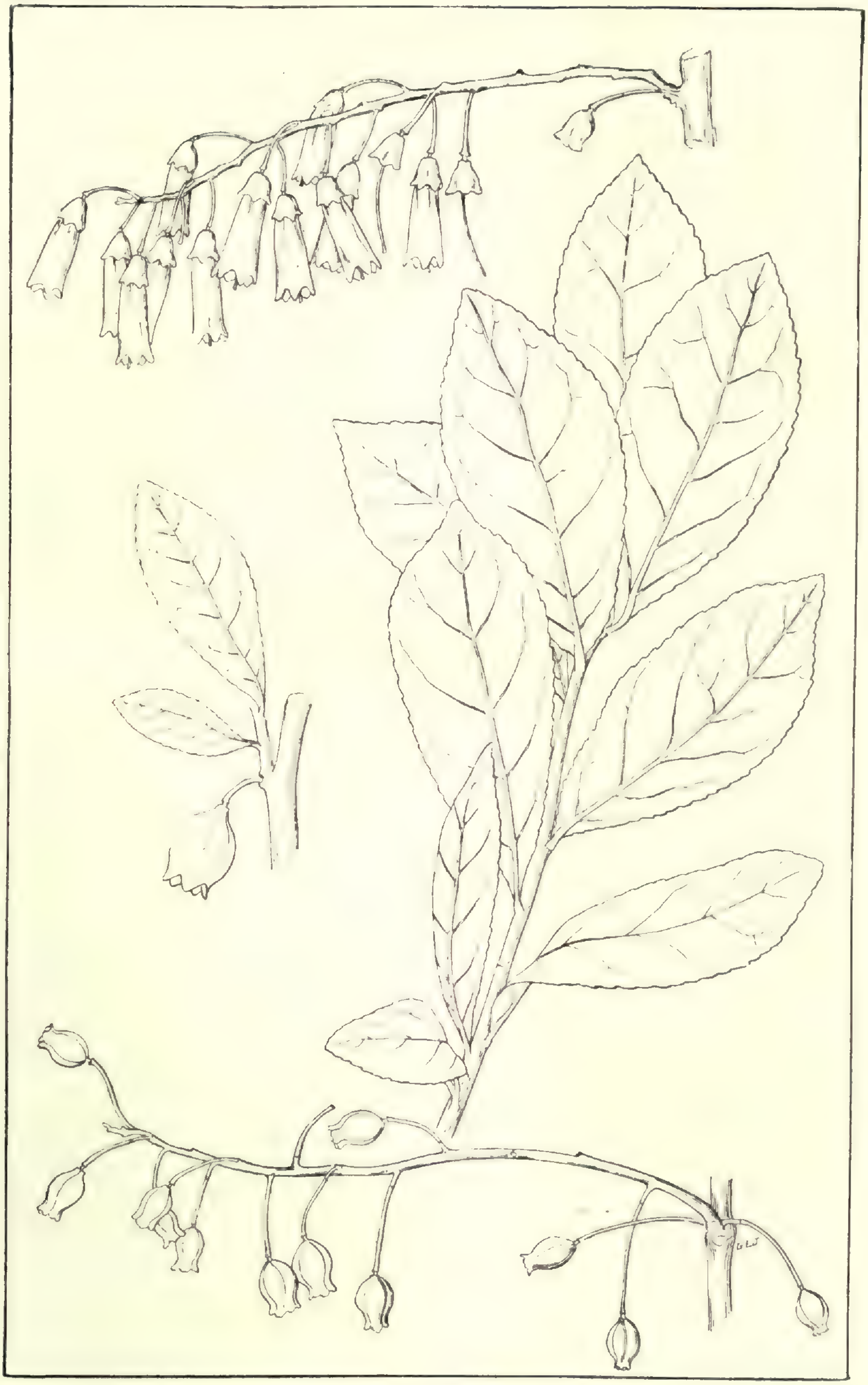
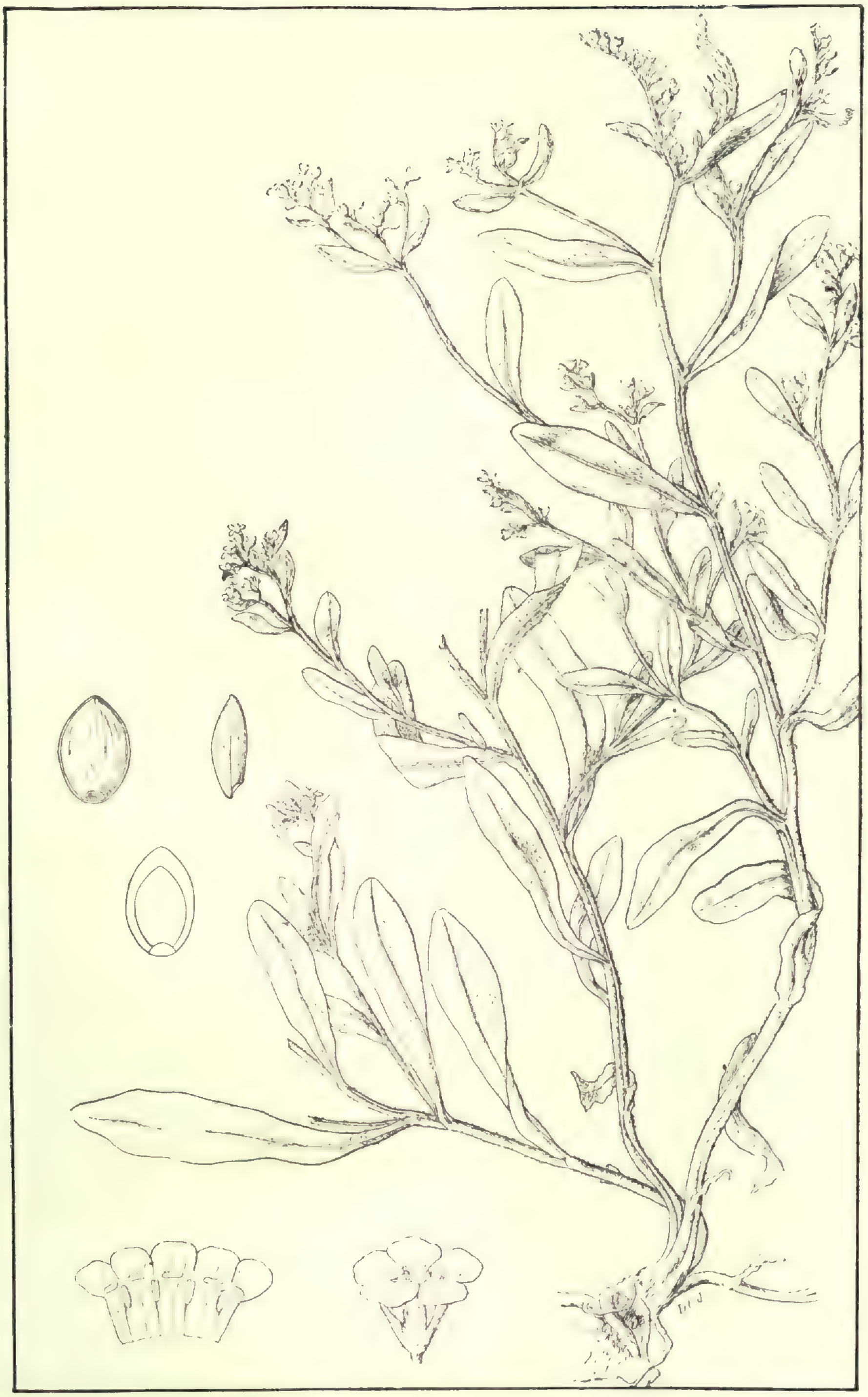


VACCINIUM CYLINDRACEUM.



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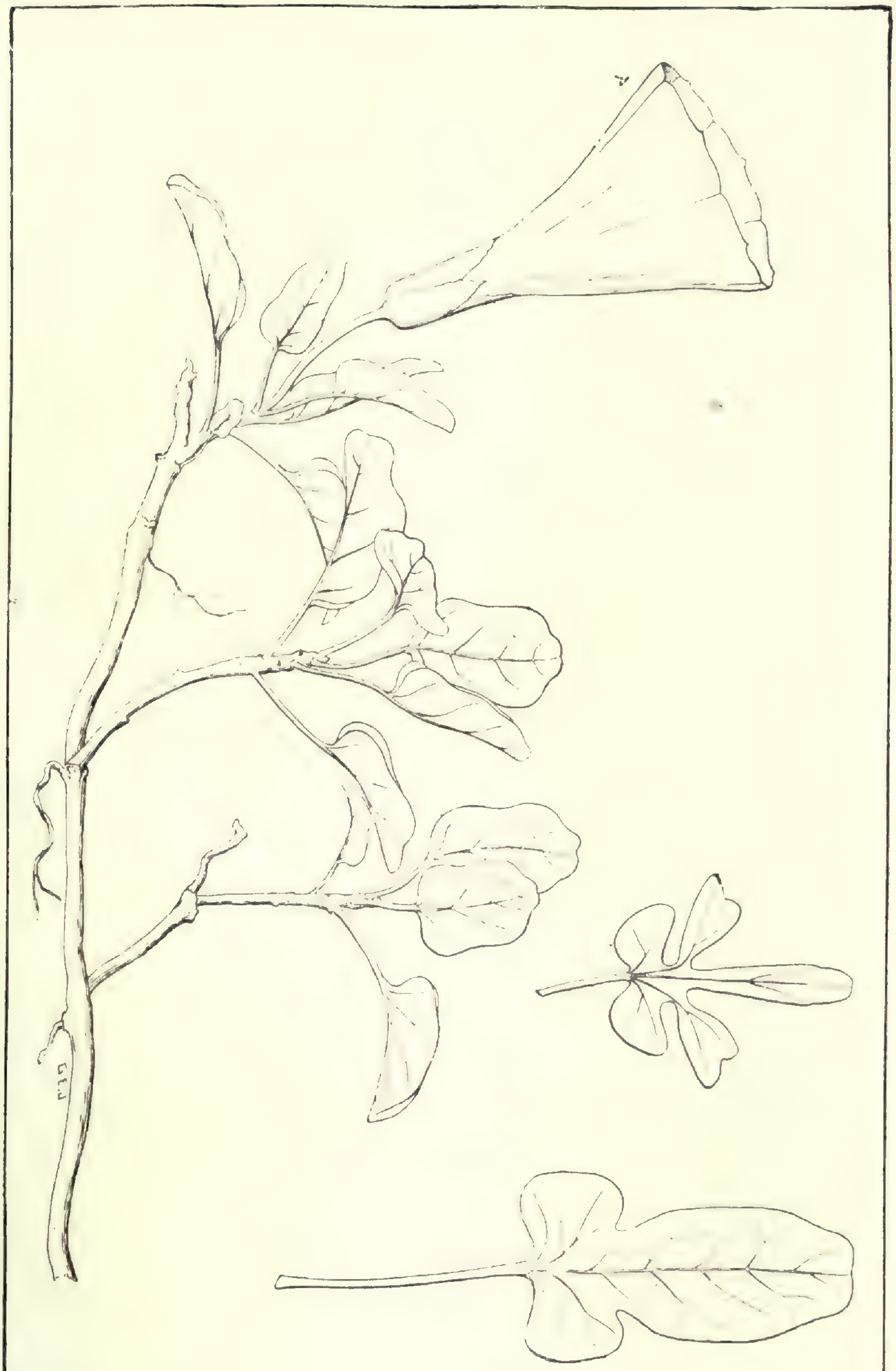

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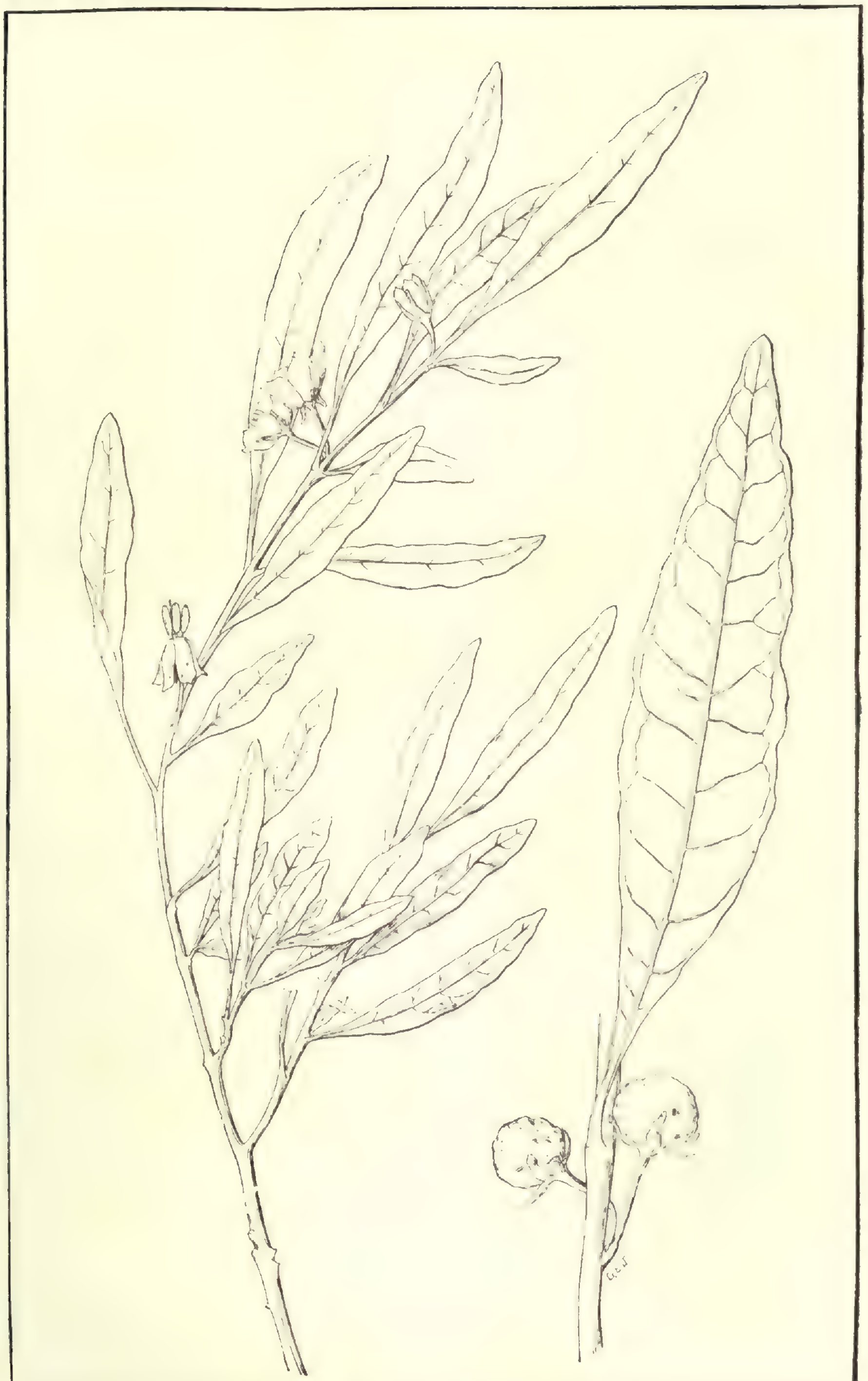
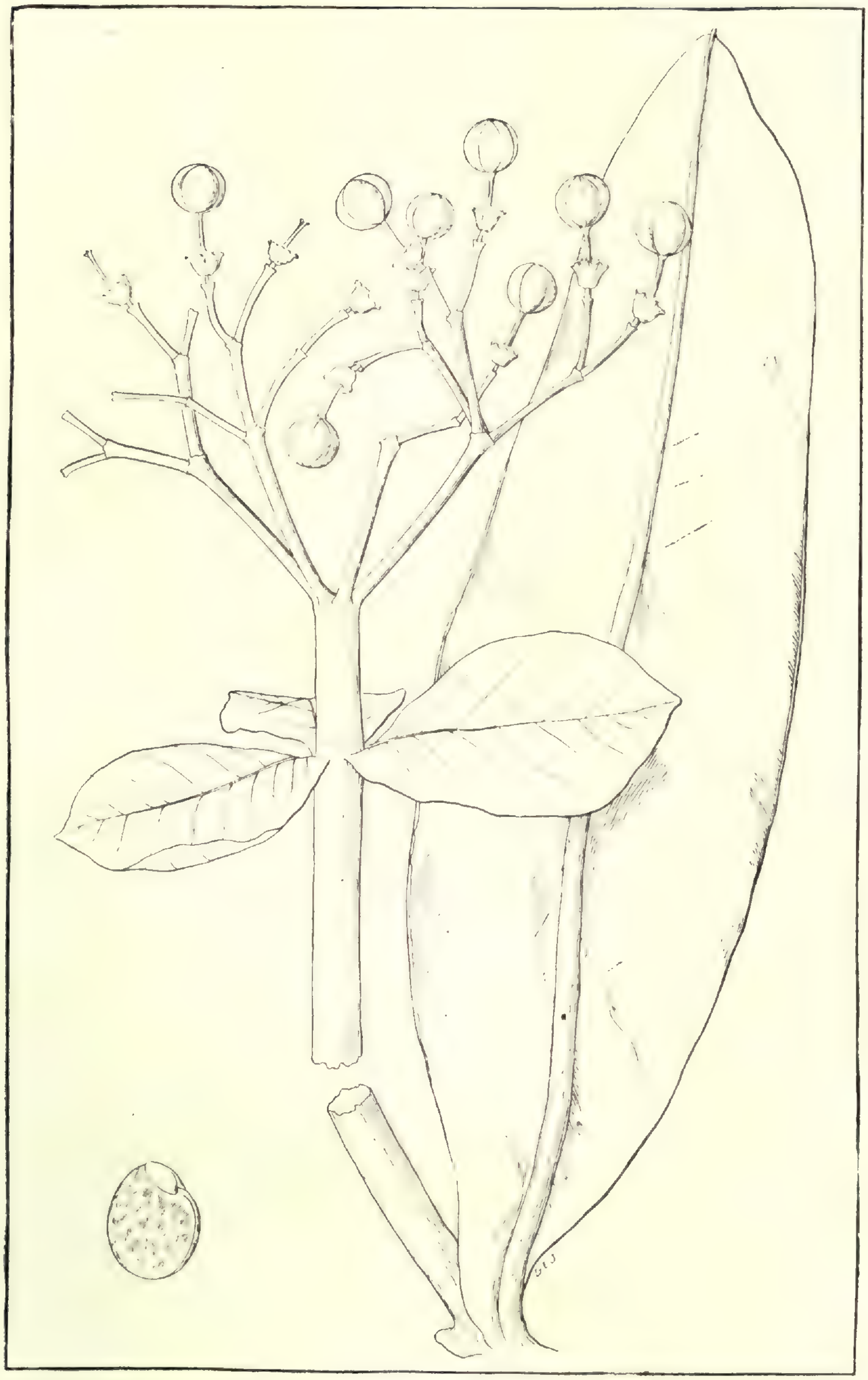


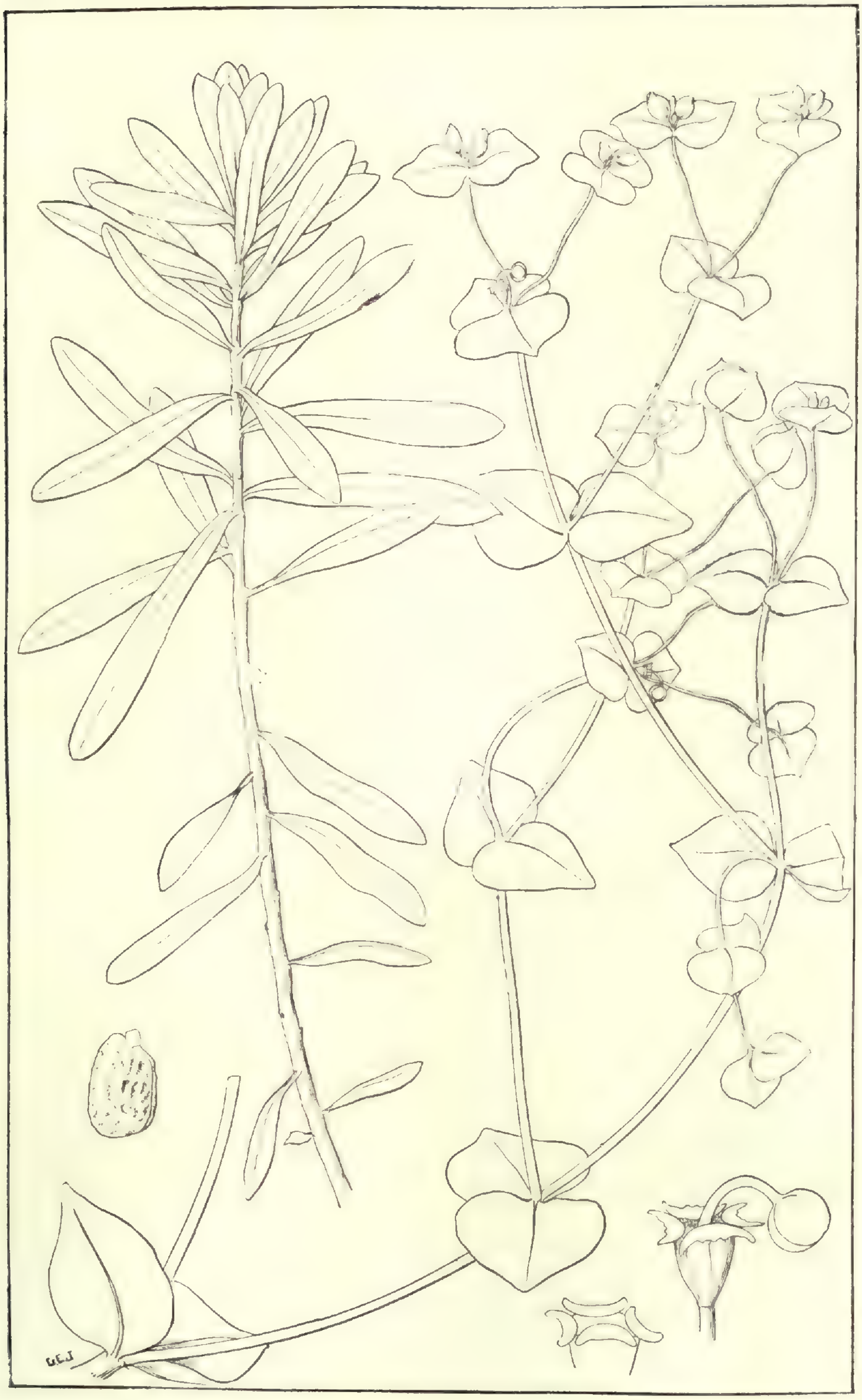
SOLANUM PSEUDOCAPSICUM.

PHYSALIS PERUVIANA.

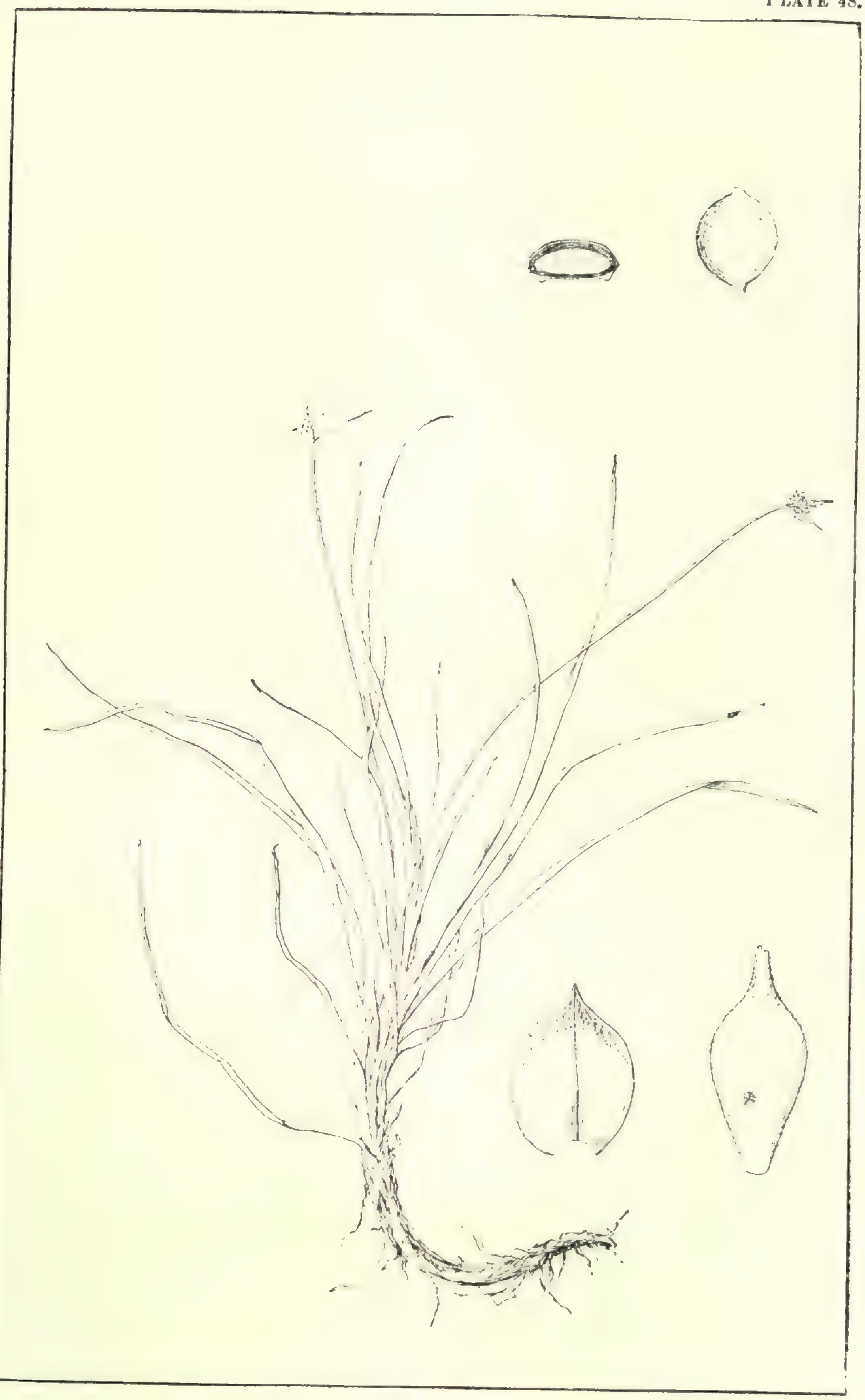
POLYGONUM SERRULATUM.



EUPHORBIA STYGIANA.



EUPHORBIA AZORICA.

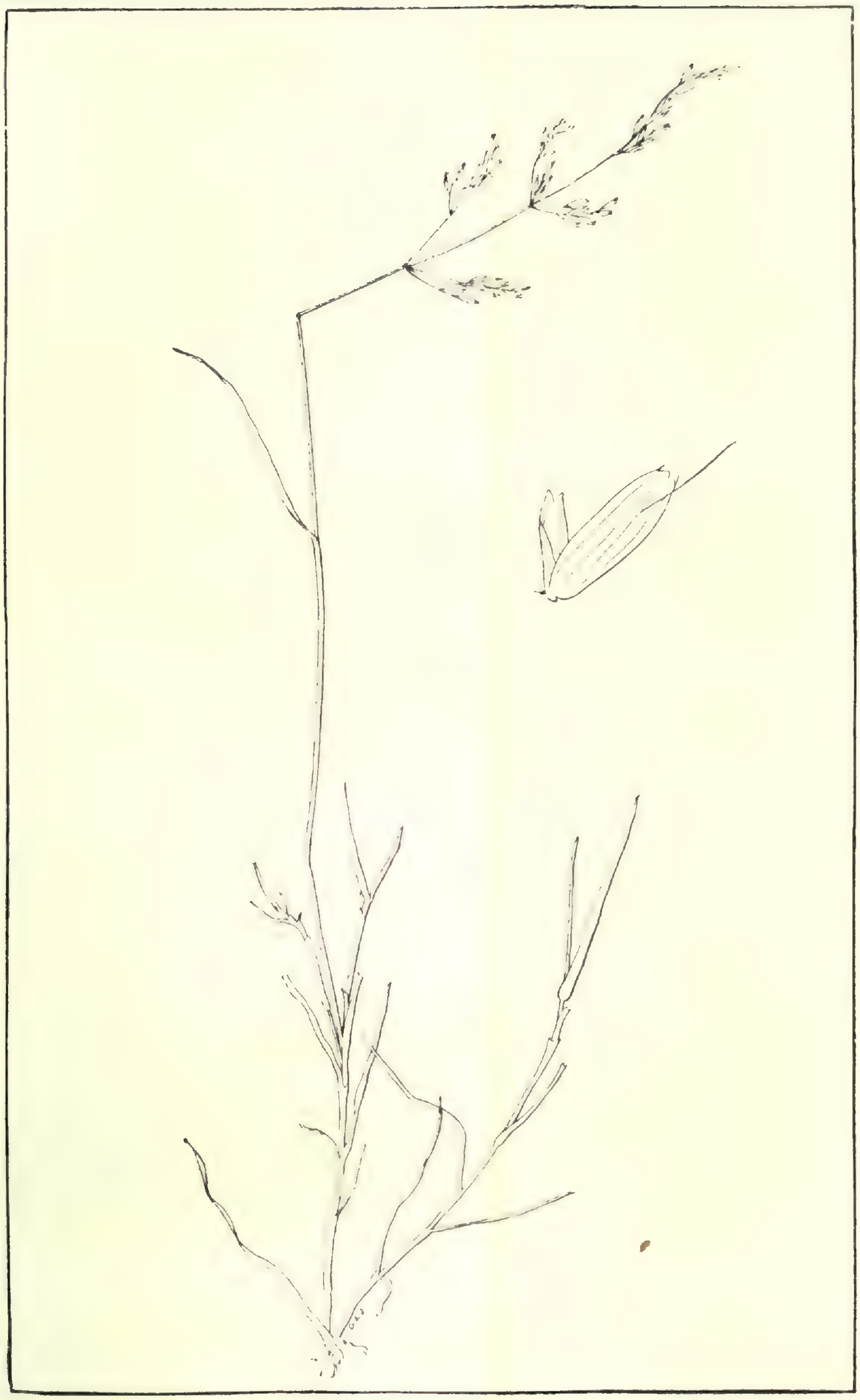


CAREX AZORICA.

CAREX MACROSTYLA, VAR. PEREGRINA.

AGROSTIS VERTICILLATA × CASTELLANA?

AGROSTIS CASTELLANA, *a.*



AGROSTIS CASTELLANA, *b.*

AGROSTIS CASTELLANA, *c.*

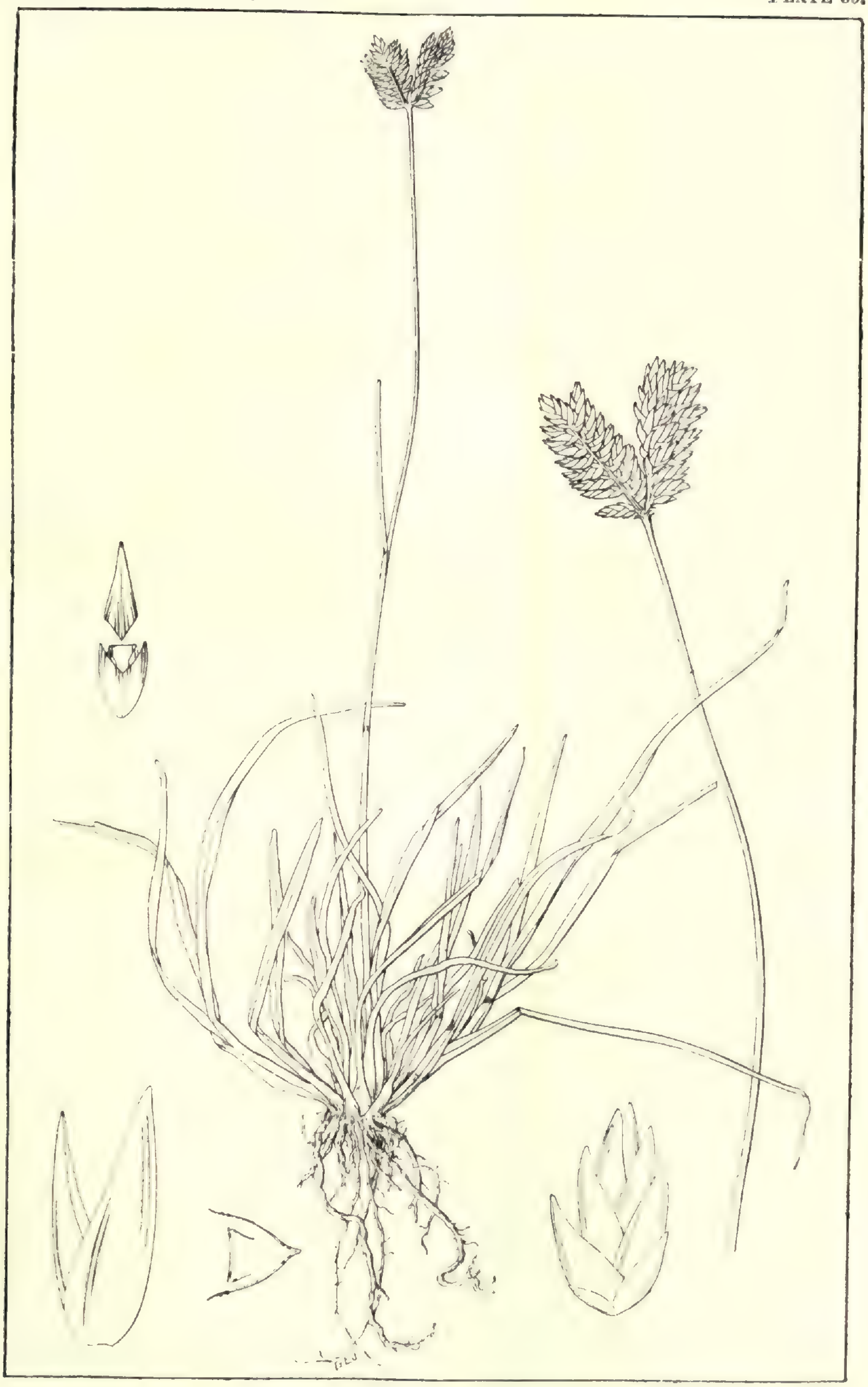
AGROSTIS CASTELLANA, *d.*

AGROSTIS CASTELLANA, *e.*

AGROSTIS CASTELLANA, *f.*

DESCHAMPSIA FOLIOSA.

DESCHAMPSIA ARGENTEA.

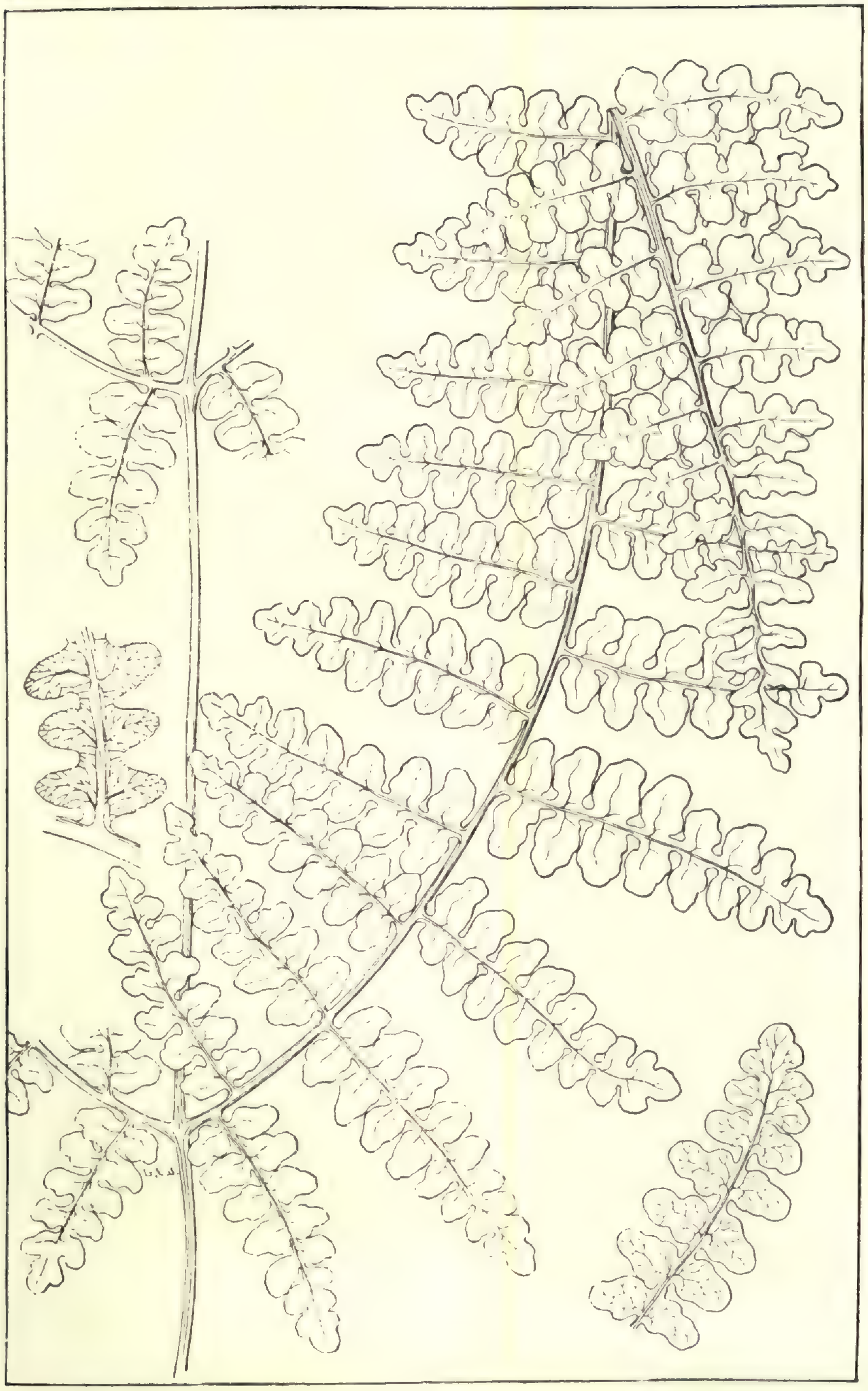


ELEUSINE BARCINONENSIS.

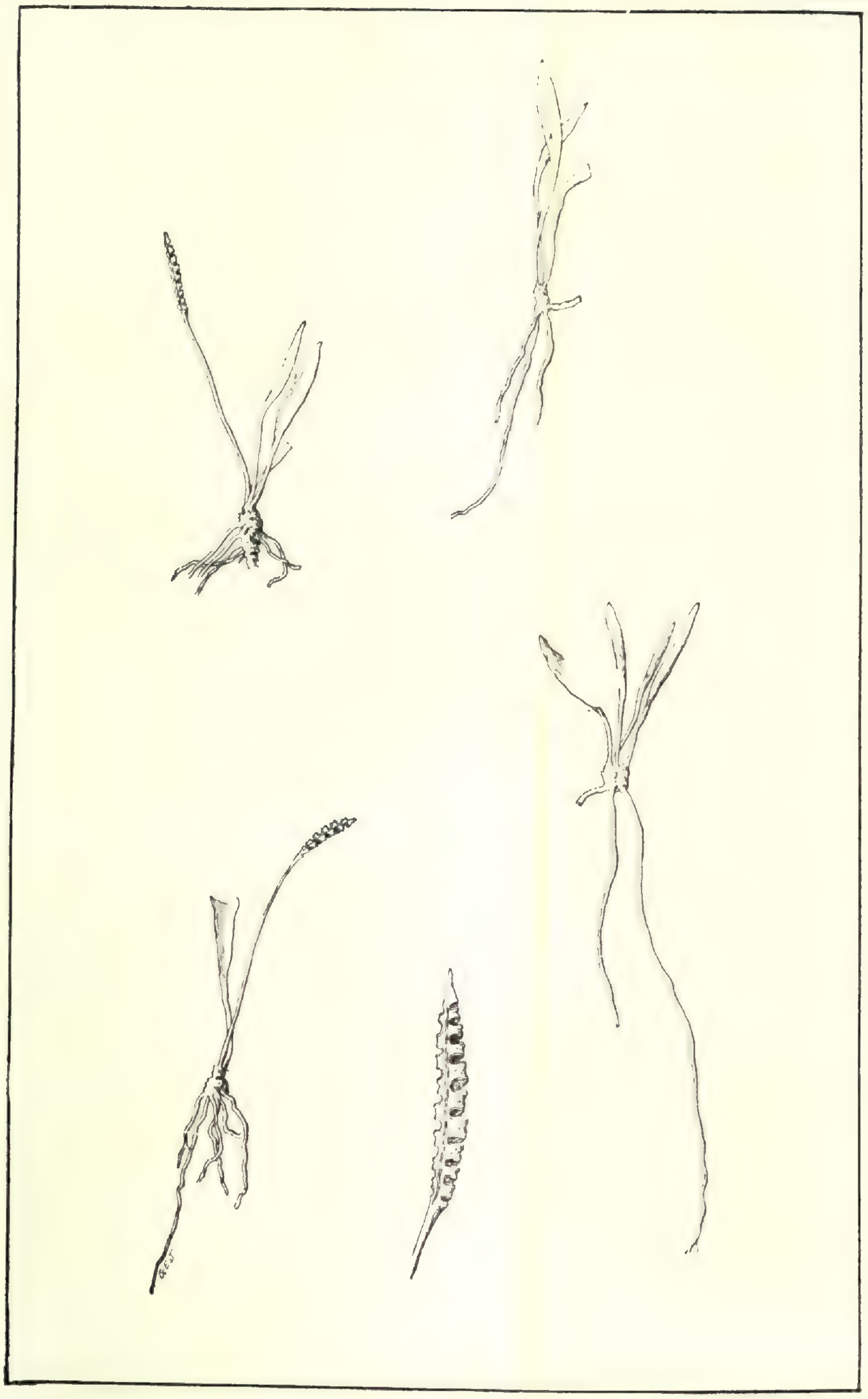
FESTUCA JUBATA.

FESTUCA PETRAEA.

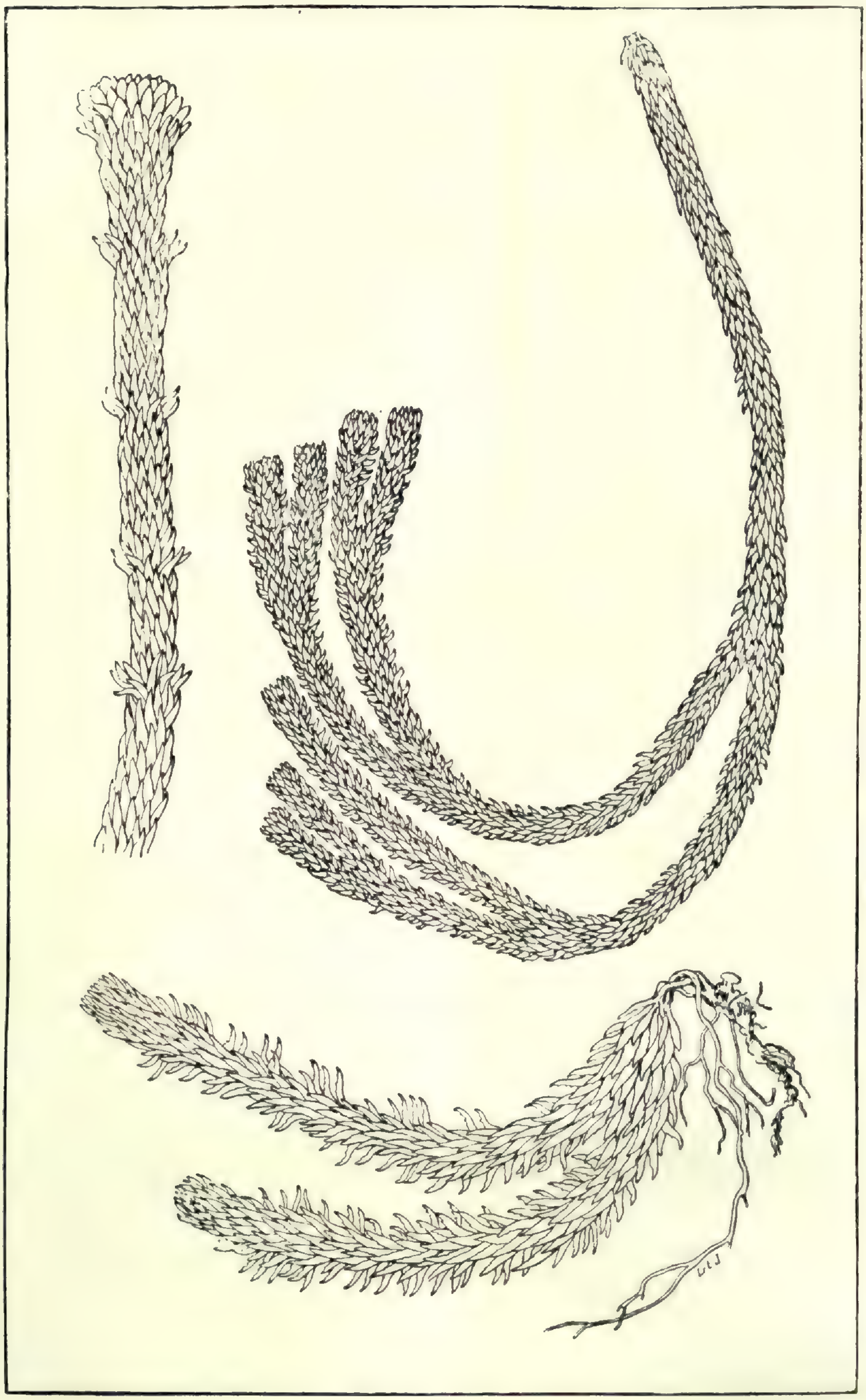
BROMUS UNIOLOIDES.



EUPTERIS AQUILINA.



OPHIOGLOSSUM VULGATUM, VAR. POLYPHYLLUM.



LYCOPODIUM SELAGO, VAR. SUBERECTUM.

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BY WILLIAM TRELEASE.

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